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Research Paper

Chemical Characteristics of Scales, Skin And Bones of Snakehead Fish (*Channa Striata*) After Soaked With Sodium Hydroxide Solution

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Abstract
Snakehead fish is one of the freshwater products that has potential in South Sumatra. Utilization of snakehead fish as a side dish and diversification product is for typical Palembang food processing. Most of these preparations used meat as a raw material, leaving waste scales, skin and bones which had the potential to be used as raw materials for collagen. One of the stages of collagen production was soaking in NaOH. The aim of this research was to examine the chemical properties of scales, skin and bones of snakehead fish after soaking in NaOH. The soaking process was carried out in 0.05M NaOH for 6 hours and the water was changed every 2 hours with a ratio of waste to NaOH solution of 1:10. The parameters analyzed included water content, ash content and protein. The results showed the proportion of scales, skin and bones of snakehead fish respectively of 6% scales, 5.7% skin and 4.20% bones. Proximate analysis tests showed levels in snakehead fish scales of 55.67%, skin by 81.15% and bones by 50.80%. The average value of ash content was in snakehead fish scales of 48.14%, skin by 9.27% and bones by 55.42%. The average value of protein content was in snakehead fish scales by 29.60%, skin by 67.59% and bones by 23.66%.

Keywords
Chemical analysis, NaOH, Snakehead fish waste

1. INTRODUCTION

South Sumatra is one of the provinces on the island of Sumatera which has quite extensive public water resource potential, around 2.5 million hectares consisting of rivers and wetlands which makes South Sumatra part of the freshwater habitat in Indonesia (Mutiara and Sahadin, 2017). One of the fish that has potential economic value from these waters is the snakehead fish. The production volume of snakehead fish in South Sumatra in 2021 reached 10,236.74 tons, the total production has increased from 8,227.68 tons in the previous year, namely 2020 (KKP Statistics, 2021). The use of snakehead fish, especially in the city of Palembang, is not only consumed as a side dish but can also be used as raw material for making processed food typical of the city, namely by using the meat (Jaya and Rochyani, 2020).

Most snakehead fish consumption is only its meat, while other parts such as the head, bones and skin are disposed of as waste (Yuniar et al., 2017). Efforts have been made to reduce the waste by processing it into value-added products such as snakehead fish heads processed into processed pindang (Indonesian food), and some craftsmen also process skin and bones into crackers. However, these utilization efforts have not maximally reduced the amount of snakehead fish waste from markets that sell ground snakehead fish meat. Therefore, it is necessary to diversify other values products so that snakehead fish waste can be utilized optimally. To find out the direction of utilization of snakehead fish waste so that it can be used as various products, it is necessary to know the chemical composition of snakehead fish parts, especially waste such as scales, bones and skin because this waste is usually used as a source of protein, especially collagen. According to Rosmawati (2018), the structural parts of snakehead fish such as scales, skin and bones contain about 30% collagen protein (Renaldi et al., 2022). To understanding the chemical composition related to proximate is important to facilitate the direction of its use, especially in industry.

Chemical analysis of the content of chemical compounds in snakehead fish waste has been carried out by previous researchers. Rosmawati (2018) analysed the chemical content

of snakehead fish bone waste from body weights derived from snakehead fish with sizes of 300-400 g/head, 600-700 g/head and 900-1,000 g/head prepared by the pretreatment process, namely degreasing. However, testing the chemical composition of proximate (water, ash, protein) on other parts of the waste has not been widely carried out. For this reason, in this study tested the proximate chemical composition of waste scales, skin and bones from snakehead fish body parts. In this study, pretreatment of immersion with NaOH solution was carried out in order to obtain proteins that have the potential to be in the waste. Immersion in Sodium Hydroxide solution which serves to reduce the salt content and other organic compounds and non-collagen protein compounds by dissolving scales, skin and bones of snakehead fish in NaOH solution which is then known as the chemical composition in the form of proximate test results which will later facilitate the direction of its utilization (Dwijayanti et al., 2023).

2. EXPERIMENTAL SECTION

2.1 Material

The skin, scales and bones of snakehead fish were collected from traditional market of Soakbato market, Palembang, South Sumatera, Indonesia. The chemical solutions used in this study were NaOH 0.05M with ratio 1:10 (w/w) of analytical grade from Sigma-Aldrich.

2.2 Sample Preparation

Samples of scale, skin and bone waste from snakehead fish of 200-250 g/head were weighed. Snakehead fish were weeded by separating all parts such as flesh, head, scales, fins, skin, bones and intestines. After being separated, the parts were then cleaned and washed before weighing so that the weight percentage of the fish parts was known. Next, the waste scales, skin and bones that had been cleaned and washed were carried out for pretreatment by soaking each waste in a 1:10 solution of 0.05 M NaOH for 6 hours and changing the water every 2 hours. After the soaking was completed, the waste was washed until the pH was neutral and next chemical analysis. The treatment were of three replicated (Lee et al., 2022; Ranti et al., 2019).

2.3 Chemical Analysis

Waste snakehead fish scales, skin and bones that had been pretreated with 0.05 M NaOH were then analyzed chemistry including water, ash and protein. The determination of water content, ash content and protein content followed the method of Association Of Official Analytical Chemist, Inc. (2005).

2.4 Data Analysis

The data that had been collected was processed and analyzed using Microsoft Excel 2021, then the average was obtained and plotted in a graph to be discussed descriptively.

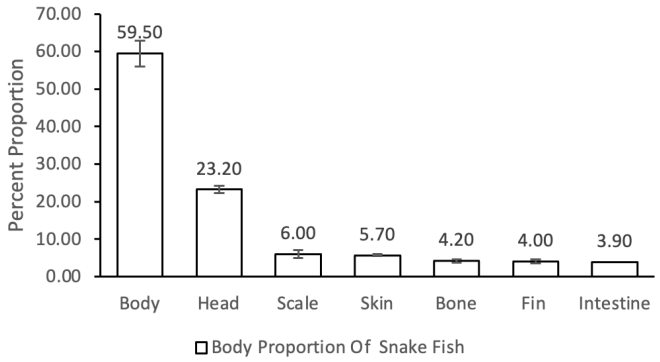

Figure 1. Body Proportion of Snakehead Fish

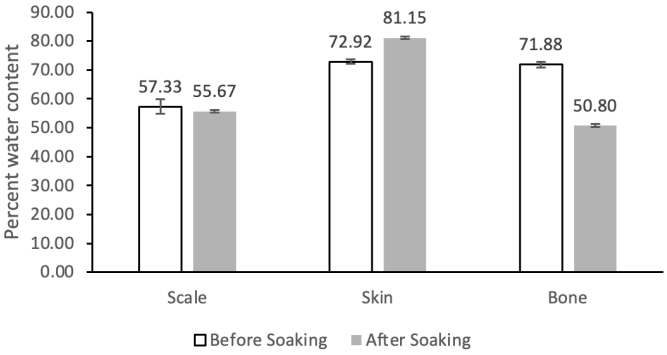

Figure 2. Average water content value

3. RESULTS AND DISCUSSION

3.1 Proportions of Snakehead Fish Body Parts

The assessment of snakehead fish body parts aimed to determine the percentage of waste from snakehead fish. The snakehead fish used in this study had a percentage of 59.5% of the body, 23.2 percent of the head, 6.0 percent of the scales, 5.7 percent of the skin, 4.2 percent of the bones, 4.0 percent of the fins and 3.9 percent of the intestine (Fig.1). Around 45-70 percent of the fish's body parts were consumed whole and the remaining almost 30 percent was discarded as waste (Akter et al., 2016; Yuniar et al., 2017).

3.2 Proximate Composition

3.2.1 Water Content

Moisture is a very important component in food ingredients because it can influence the characteristics of food ingredients such as texture and taste as well as the shelf life of food ingredients because it is closely related to the activity of microorganisms. The water content value is expressed in percent units. The water content values of waste snakehead fish scales, skin and bones treated with NaOH can be seen in Fig 2.

The results of the research showed that the water content in general did not increase significantly and tended to be high because the waste raw materials for scales, skin and

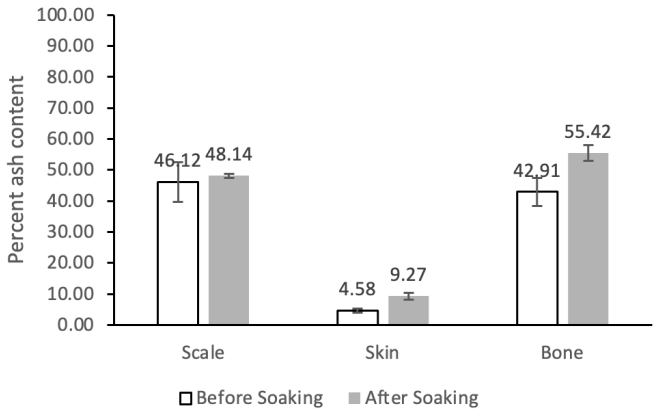

Figure 3. Average ash content value

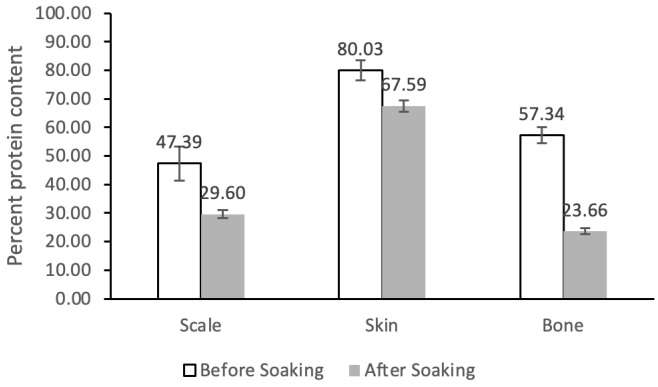

Figure 4. Average protein content value

bones were not dried and washing was carried out after soaking. Apart from that, because the NaOH solution easily soluble in water, even if it is soaked for 6 hours, it did not have a significant effect (Sidik, 2016).There were differences in water content in waste snakehead fish scales, skin and bones, this was due to differences in the function of these tissues (skin, scales and bones) which are related to their biochemical activity (Rosmawati, 2018).

3.2.2 Ash Content

The ash content value is one of the parameters that shows the purity of a material. In this study, the ash content value was determined to determine the amount of mineral content and inorganic substances contained in waste snakehead fish scales, skin and bones after pretreatment with sodium hydroxide soaking, expressed in percent. The average ash content value of snakehead fish scale, skin and bone waste can be seen in Fig 3.

The results of the research showed that there was an increase in the value of ash content in waste scales, skin and bones of snakehead fish which had been soaked using sodium hydroxide for 6 hours. This is due to the addition of salt, minerals such as alkali and can also be due to incomplete washing (Mirza et al., 2013). The ash content of snakehead fish bones that were soaked in 0.05 M NaOH for 6 hours had the highest percentage when compared with the ash content of snakehead fish skin and scales waste. This is due to the different functions of the tissues (skin, scales and bones) which are related to their biochemical activities (Rosmawati, 2018). According to Apriliani et al. (2023), the lower the ash content of a material, the higher its purity. The high or low ash content of a material is caused, among other things, by different mineral content in the raw material source and can also be influenced by the demineralization process (Fitria, 2017).

3.2.3 Protein Content

Protein is the most dominant compound in animal foods, especially fish. Measurement of protein content in waste snakehead fish scales, skin and bones was carried out using the Kjeldahl method. The average ash content value of snakehead fish scale, skin and bone waste can be seen in Fig 4.

The results of measuring protein levels showed that there was a decrease after the soaking process using sodium hydroxide compounds. This is due to the presence of NaOH which causes swelling in waste, thus facilitating the dissolution of non-collagen protein compounds and the alkaline nature of sodium hydroxide which can denature proteins by breaking salt bridges contained in proteins (Gustini et al., 2023; Reliantari et al., 2017). In addition, the presence of compounds ($Ca(OH)_2$) can break down the structure of amino acids that make up food so that it undergoes denaturation (Pangke et al., 2016). The lowest protein content is in the bones at 23.66% and the highest is in the skin at 67.59%. The difference in the value of protein content is thought to be caused by the proportion of snakehead fish body parts that have different protein levels (Rosmawati, 2018). Based on the percentage of decrease in protein levels before and after soaking with NaOH solution, snakehead fish scales decreased by 17.79%, skin by 12.44% and bones by 33.66. From these data, it shows the highest decrease in protein, namely in the bones and the lowest, namely in the skin. The decrease occurs due to the content of non-collagen protein compounds in small amounts in waste, especially in snakehead fish bones so that during the soaking process these compounds will dissolve and be wasted during washing. In general, the decrease in protein in fish skin is less, this is because the skin contains more collagen protein compounds when compared to scales and bones. According to Kolanus et al (2019), fish skin contains 80% collagen which is a constituent of protein in fish skin. In line with Wulandari (2016) said that collagen compounds in scales range from 10%, skin around 16.57% collagen and

fish bones less than 10%.

4. CONCLUSION

The proportion of waste scales, skin and bones of snakehead fish in snakehead fish of 200-250 g was 6% scales, 5.7% skin and 4.20% bones. The results of water proximate analysis after soaking in 0.05M NaOH solution for 6 hours include water content, ash content and protein content, namely the average value of snakehead fish scales were 55.67%, skin of 81.15% and bones of 50.80%. The ash content was in snakehead fish scales of 48.14%, skin by 9.27% and bones by 55.42%. The protein content was in snakehead fish scales by 29.60%, skin by 67.59% and bones by 23.66%.

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