AFSSAAE

Advances in Food Science, Sustainable Agriculture and Agroindustrial Engineering 2018, 1(2), 40-42
ISSN 2622-5921

ORIGINAL RESEARCH Open Access

# Supplementation of snake-head fish bone powder for making cookies

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**KEYWORDS**

Cookies
Snake-Head Fish Bone
Fish Waste Processing

**ABSTRACT**

Snake-head fish bone is one of industrial fish processing waste which can be used as a mineral source. However, the utilisation of fish bones in food products has not been optimized. The aim of this research was to utilize Snake-head fish bone for making cookies and to evaluate their chemical properties and sensory acceptability of the product. Snake-head fish bone was first steamed, dried, milled into powder then mixed with wheat flour and other additional ingredients. The result showed that cookies which made from SP-318 formula (20% Snake-head fish bone powder and 80% wheat flour) were the best result for all sensory attributes. It presented like moderately for the hedonic score. Protein, ash moisture, carbohydrate, and fat contents of the SP-318 formula were 10.77%, 8.10%, 9.25 %, 44.23%, and 7.65%, Overall, this study clearly showed that it was possible to make cookies which supplemented by Snake-head fish bone powder and the product did not have any negative results on sensory attributes.

## Introduction

Waste from the fish processing industry is one of the problems in the fishery processing industry. The waste problem must be addressed with resolved properly and planned. Utilisation of Snake-head fish (*Channa striata*) bone as a source of minerals, especially calcium and phosphorus is an effort to increase the economic value of waste fish bones. The fraction of solid waste fishbone was about 10-15% of the fish weight as a whole excluding the skin, and it is a potential source for protein, unsaturated essential fatty acids, vitamins, antioxidants, amino acids and minerals (60-70%) in the form of inorganic salts, especially calcium phosphate, creatine phosphate and hydroxyapatite (Huang et al., 2011). Image of Snake-head fish is seen in Fig. 1.

**Figure 1**. Snake-head fish (*Channa striata*) (https://faat.co.id)

Several studies on the utilisation of snake-head bone fish and potential application as source natural calcium has been done, such as fortification of snake-head bone fishpowder on crackers as a source of calcium (Kim and Mendis, 2006). Snake-head fish bone waste as an alternative source calcium in dried noodle products (Mulia, 2004), potential as a natural source of calcium that can be fortified in food products to meet the daily calcium intake.

The aim of this research was to use snake-head bone fish powder for making cookies. Generally, cookies have a sweet flavor with main ingredients of low-protein wheat flour, which processed and baked until it cooked and firm. According to SNI 01-2973-1992, cookies are one of biscuit types made of soft, high fat, and it is relatively crisp when broken and it has a solid texture (Murtiningrum, 1997). The study was also aimed to determine the effect of adding snake-head bone fish powder to the organoleptic and chemical characteristics of the cookies.

## Research Methods

### *Snake-Head Bone Powder Preparation*

The first step in making snake-head bone fishpowder was cleaning fish bones. The cleaned bone was then boiled in an aluminum pan for 30 minutes at 80 $^{o}$C.

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The size of the fish bone was reduced by 5 - 10 cm. It was followed with the second boiling of the bone at 100 $^{o}$C for 30 minutes. Then, it washed with water. The boiled and cleaned bone was dried using an oven at 65 $^{o}$C for 10 hours. The dried bone was milled using a grinder (Elfauziah, 2003).

***Preparation of Cookies***

In this study, three cookies were formulated by mixing snake-head bone powder, wheat flour and additional ingredients. Snake-head bone powder was mixed with wheat flour with the ratio as shown in Table 1. Other ingredients then added into the mixture as much as 10% of the total volume of the mixture. The cookies formulas and ingredient compositions canbe seen in Table 1 and Table 2, respectively.

**Table 1.** Ratio of snake-head bone fish powder and wheat flour of cookies formulas

| Formula | Snake-head bone fish powder (%) | Wheat Flour (%) |
|---|---|---|
| Cookies 291 | 90 | 10 |
| SP-318 | 80 | 20 |
| Cookies 197 | 70 | 30 |

**Table 2.** Ingredients composition of the cookies

| Ingredients | Quantity (%) |
|---|---|
| Butter | 66 |
| Food Coloring | 25 |
| Milk powder | 25 |
| Refined sugar | 20 |
| Chocolate powder | 5 |

***Sensory Analysis***

The cookies samples were subjected to sensory analysis for attributes of color, aroma, texture and taste using Hedonic Scoring Scale (SNI, online). The scoring scale used was between 1-5 with the scores representing the hedonic attributes of 5, 4, 3, 2, 1 were “like very much”; “like”; “like moderately”; “dislike”; “dislike very much”, respectively. The samples were tested by 25 panelist.

***Chemical Analysis***

The chemical compounds of the best formula were measured using AOAC methods (Larmond, 1977). Oven drying and weighing methods (926.12, 41.1.02) were used to measure the moisture content. Ash content was measured by weighing and furnace methods at 600°C for 3-5 h (942.05, 4.1.10). Fat extraction using sohxlet distillation and chloroform as a solvent was used to measure the fat content (948.22, 40.1.05). The protein content was measured using Kjeldahl distillation and the nitrogent value was converted to protein value using conversion factors (960.52, 12.1.07). The carbohydrate content was measured by difference method.

**Results and Discussion**

***Sensory analysis***

Sensory analysis was an important test in the product development. This is due to the consumer point of view was always a predominant determinant of acceptability of a new product (AOAC, 2005). The best formula of the cookies was evaluated by making cookies from each formula then subjected to sensory acceptability. The result is seen in Fig. 2.

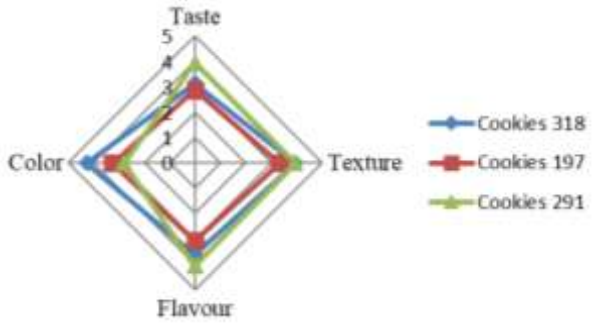


**Figure 2**. Sensory analysis of cookies

Fig. 1 showed that cookies 318 formula (SP-218) has the highest score for all sensory attributes. SP-318 has a color preferred by the panelists. Using snake-head bone fish powder in making cookies has no significant effect on the color output. This is due to the addition of chocolate powder and caramelisation reactions occurred during the baking process. The resulting aroma on cookies was influenced by the aroma of snake-head bone fish. It creates a scent on cookies, which was less preferred by the panelists. It is because the fishy smell of a snake-head bone fish was stronger than the scent of other added ingredients. Most of the panelists were tend to like cookies 291 formulations due to the addition of a small amount of snake-head bone fish powder. The fishy taste and aroma coming from snake-head bone fish powder causing the strong fishy smell to happen. Furthermore, an increase in the amount of snake-head bone fish added to the cookies mixture can create a more crispy texture. Crispness in cookies was caused by the protein contained in snake-head bone fish powder, which has a cluster hydrophilic more than that on in starch, thus increasing the savory texture.

***Chemical composition of Cookies***

The chemical composition of cookies is presented in Table 3. The water content of cookies as a control

(i.e. without addition of fish bone flour) was 9.98%, the cookies 318 formulation (ratio of 80:20) or as the best treatment was 9.25%. The moisture content is the most fundamental parameter because it affects the shelf life of the product. Based on SNI 01-2973-1992, the maximum value of water content for cookies is 5%. The high water content in the cookie product can be due to the addition of other ingredients which have a high water content (Pratama, 2011; Faiza et al., 2015).

**Table 3**. Chemical composition of cookies with the best treatment

| Constituents | Control | SP-318 |
|---|---|---|
| Moisture | 9.98 | 9.25 |
| Fat | 28.57 | 27.65 |
| Protein | 9.44 | 10.77 |
| Ash | 5.06 | 8.10 |
| Carbohydrate | 46.95 | 44.23 |

The fat content on control cookies and cookies 318 was 28.57% and 27.65%. This is caused by material like butter, cocoa powder, milk, and eggs. While the protein content in SP-318 as well as control was 10.77% and 9:44%. The ash content of control cookies was 5.06%, while cookies SP-318 formulation (ratio of 80:20), or as the best treatment was amounted at 8.10%. The ash content in cookies increases along with the increasing amount of snake-head bone fish powder added to the cookies dough. The ash content of a material indicates the minerals contained in the ingredients. The greater ash content indicated food stuffs. But, the ash content high can affect the durability of cookies to development. A high ash content can cause a decrease in durability of the dough development (Fellows, 2000). Similarly, the carbohydrate content was also high at value of 46.95% and 44.23%, respectively; which may be potentially influenced by the addition of wheat flour.

## Conclusions

This study confirmed that the cookies product has the hedonic score of "like moderately" for all sensory attributes. SP-318 formula contained protein, ash, moisture, carbohydrate, and fat as much as 22.23%, 2.92%, 7.27%, 62.8%, and 4.67% of fat, respectively. Overall, this study clearly underlined the potency of snake-head fish bone powder to make cookies with less complicated process and the product did not have any negative results on sensory perception.

### Conflict of interest

The authors declare that there is no conflict of interest in this publication.

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