Proximate Analysis of Hotong Buru (Setaria italica) As A Culinary Material in Southern Buru Regency

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Abstract

Hotong Buru (*S. italica*) is a kind of cogon grass originating from the island of Buru. This plant produces seeds that are used as a very potential alternative food for rice because this plant can grow on various types of soil, even on sandy soils. Proximate analysis is a chemical test to determine the nutrient content of a feed or a feed raw material. Moreover, Hotong seeds have a protein content of around 11.2% and about 2.4% fat, while rice has a protein content of around 4.5% and 1-2% fat, which means that the protein and fat contents of Hotong seeds are over twice higher than that in rice. Judging from the carbohydrate content, the content of Hotong seeds is around 73%, almost the same as the carbohydrate content in rice, which is around 70-80%. This research was conducted to determine the nutritional content of Hotong Buru as a culinary ingredient. The research was conducted in the area of South Buru Regency, namely processing Hotong Buru as a culinary ingredient, and in Baristand Ambon, namely proximate analysis. The results of the proximate analysis of 10 types of Hotong Buru in culinary preparations, resulted in the discovery of carbohydrate content with an average of 75.04, protein content with an average of 17.98, fat content with an average of 6.54, and fiber content with an average of 3.67, this proves that the nutritional content of culinary Hotong Buru is very high and can be used as the right staple substitute for rice.

Keywords: Hotong Buru (*S. italica*), protein, carbohydrate, fat content, fiber.

The invented contribution: The protein of 11.2% and fat of 2.4% contents of Hotong (*S. italica*) seeds are over twice higher than that in rice so that it can be used as the right staple substitute for rice in various types of culinary over 3500 types of culinary or special menus.

ARTICLES

I. Introduction

Food is one of the basic needs for every human being, so the availability of food for the community must always be guaranteed. Nowadays the carrying capacity of the environment is increasingly obedient so that the availability of foodstuffs has also decreased. Apart from developing processed food products, it is also necessary to evaluate the quality of nutrition. Every human being needs food for his survival. The food that enters the body is used for the growth process, replacing damaged cells, energy, and maintaining health so that the biochemical processes in the body continue to run properly. This shows that humans need certain substances from eating in certain
amounts for their survival, which is called nutrients. One of the processed products that can be developed is Hotong (*Setaria italica* (L) Beauv) [1].

Due to the high nutritional content, Hotong seeds are also used as a staple food [2], in several areas in Maluku, namely Waekatin, Waelo, Waeraman and Unet, Buru Selatan District. In general, people use Hotong seeds as a staple food for consumption after harvest and the times are also stored for a long period, starting from freshly harvested to 24 months (2 years). Apart from the time of this deviation, the Hotong seed content may decrease, including its fat content. The habits of the people on Buru Island include Waelo Village, Waekatin Village, Waeraman Village, and Unet Village. Those who consume Hotong seeds as a staple food and store Hotong seeds for a long time, but Hotong seeds have never been examined to determine their nutritional content, including their fat content. However, the proximate analysis of the Hotong Buru has not been carried out.

Proximate analysis is a chemical test to determine the nutrient content of a feed or feed raw material. The people of South Buru, Maluku Province, especially those in mountainous areas, often consume Hotong Buru as a staple food to replace rice. Hotong Buru seeds can be processed into culinary ingredients or special menus for various types of culinary about 3500 types of culinary or special menus are made from Hotong Buru, but in the manufacture of culinary ingredients, they often use dyes and other ingredients, for that testing proximate content (KH, Protein, Fat and Crude Fiber) is needed.

### II. Materials and Methods

The tools that are used are a Hotong grinding machine, mixer, AAS, camera, hot plate, oven, and analytical scales.

While the materials used are Hotong seeds, wheat flour, walnuts, distilled water, table salt, Pandanus, coconut, yeast, sugar, cooking oil, beat, corn, butter, milk, sago, onions, cooking spices, brown sugar, chocolate, room botter, vanilla extract, cappuccino, and soda.

#### 2.1. Population and Sample

The population in this study, namely all types of preparations made from Hotong Buru seeds. While the sample is 10 types of preparations made from Hotong Buru taken, namely as shown in Table 1.

<table>
<thead>
<tr>
<th>Number</th>
<th>Types of Processed Food</th>
<th>Sample Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dark Hotong Desire</td>
<td>DHD</td>
</tr>
<tr>
<td>2</td>
<td>Kukis Hotong no Mixer</td>
<td>KHM</td>
</tr>
<tr>
<td>3</td>
<td>Rugby Hotong Bear</td>
<td>RHB</td>
</tr>
<tr>
<td>4</td>
<td>Sagu Keju Hotong</td>
<td>SKH</td>
</tr>
<tr>
<td>5</td>
<td>Stik Hotong Bawang</td>
<td>SHB</td>
</tr>
<tr>
<td>6</td>
<td>Zebra Hotong</td>
<td>ZH</td>
</tr>
<tr>
<td>7</td>
<td>Yanhai Cookies Hotong</td>
<td>YCH</td>
</tr>
<tr>
<td>8</td>
<td>Kue Kenari Hotong</td>
<td>KKH</td>
</tr>
<tr>
<td>9</td>
<td>Cookies Pandan Hotong</td>
<td>CPH</td>
</tr>
<tr>
<td>10</td>
<td>Chese Ball Hotong</td>
<td>CBH</td>
</tr>
</tbody>
</table>
2.2. Proximate analysis

Proximate analysis is an analysis performed to predict the chemical composition of a material, including analysis of moisture, ash, fat, protein, and crude fiber content.

The ash content is measured by the gravimetric method. The ash content is determined according to the following equation:

\[
\text{Ash content (\%)} = \frac{(B - C)}{(B - A)} \times 100\%
\]

Note:
A: Weight of empty porcelain cup (g)
B: Weight of plate with sample (g)
C: Weight of plate with sample after drying (g)

**Protein content (crude)** is determined by determining the total amount of nitrogen (N) in a substance (assuming: every amino acid contains N). Protein content measurements were carried out using the **Kjeldahl method**. The protein content is calculated by the following formula:

\[
\text{Nitrogen (\%)} = \frac{\frac{\text{Vol}_{\text{HCl}} \times \text{Sample weight (mg)} - \text{Vol}_{\text{HCl}} \times \text{blank}}{0.1 \times \text{HCl}} \times \text{FP} \times 14}{\times 100\%
\]

Protein (\%) = \% N x FK

Note:
FP: Tool correction factor = 2.5
FK: Conversion factor = 6.25

**Fat content** was determined by the **Soxhlet method**. Fat content is calculated using the following formula:

\[
\text{Fat content (\%)} = \frac{W_2 - W_1}{W_3} \times 100\%
\]

Note:
W1: Sample weight (g)
W2: Weight of empty fat flask (g)
W3: Weight of pumpkin fat with fat (g)

**Analysis of carbohydrates (KH)** was carried out by difference, namely the result of a reduction of 100% with water content, ash content, protein content, and fat content so that the carbohydrate content depends on the reduction factor. This is because carbohydrates are very influential on other nutrients. Analysis of carbohydrate content can be calculated with the following equation:

\[
\text{Carbohydrate (\%)} = 100\% - (\text{Water Content + Ash Content + Fat Content + Protein Content})
\]

**Crude fiber content** was analyzed using the method of [3]. Crude fiber content can be calculated by the formula:

\[
\text{Crude fiber content (\%)} = \frac{\text{Weight of filter paper-fiber (g)} - \text{Weight of filter paper (g)}}{\text{Weight of initial sample (g)}}
\]

III. Results and Discussion

The results of the proximate analysis of 10 types of Hotong Buru culinary preparations can be seen in the Table 2 and Fig. 1, as follows:
TABLE 2. Results of 10 Proximate Analysis of Hotong Buru Culinary Processes

<table>
<thead>
<tr>
<th>NO</th>
<th>Processed Food</th>
<th>KH</th>
<th>Protein</th>
<th>Fat</th>
<th>Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DHD</td>
<td>73.7</td>
<td>8.2</td>
<td>5.4</td>
<td>6.3</td>
</tr>
<tr>
<td>2</td>
<td>KHM</td>
<td>80.2</td>
<td>10.6</td>
<td>4.4</td>
<td>4.4</td>
</tr>
<tr>
<td>3</td>
<td>RHB</td>
<td>82.5</td>
<td>10.7</td>
<td>5.6</td>
<td>3.3</td>
</tr>
<tr>
<td>4</td>
<td>SKH</td>
<td>80.3</td>
<td>9.3</td>
<td>6.7</td>
<td>3.2</td>
</tr>
<tr>
<td>5</td>
<td>SHB</td>
<td>60.5</td>
<td>21.3</td>
<td>4.2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>ZH</td>
<td>73.8</td>
<td>21.7</td>
<td>5.5</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>YCH</td>
<td>70.6</td>
<td>26.5</td>
<td>7.3</td>
<td>3.4</td>
</tr>
<tr>
<td>8</td>
<td>KKH</td>
<td>73.6</td>
<td>28.6</td>
<td>7.3</td>
<td>3.2</td>
</tr>
<tr>
<td>9</td>
<td>CPH</td>
<td>76.5</td>
<td>20.8</td>
<td>10.2</td>
<td>3.3</td>
</tr>
<tr>
<td>10</td>
<td>CBH</td>
<td>78.7</td>
<td>21.7</td>
<td>8.8</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Based on the results of the proximate analysis of 10 types of Hotong Buru culinary preparations, there is a carbohydrate content with an average of 75.04, an average protein content of 17.98, an average fat content of 6.54, and average fiber content of 3.67, this proves that the nutritional content culinary preparations for Hotong Buru (S. Italicca), namely carbohydrates, protein, and fat are higher when compared to the nutritional content in rice except for the fiber content. Apart from being a source of carbohydrates, processed Hotong Buru culinary is also the most important source of protein and fat in the menu of the Indonesian people, especially the people of Maluku.

The results of the proximate analysis (KH, Protein, Fat, and Fiber) are high this is because the ingredients made for the manufacture of these types of cakes contain mostly KH, because: all processed ingredients are Hotong seeds, sugar, wheat flour, etc. Other types of food substances for protein, fat, and fiber, namely: nuts, butter, milk, pandan leaves eggs, vegetables, and coconut (processed products).

Due to its high nutritional content, Hotong Buru's culinary preparations can be used as a staple food. According to the [2], in several areas in Maluku, namely on the island of Buru, people generally use Hotong Buru as a staple food. Also, according to [4], Hotong plants, when processed into biscuits, have the potential to reduce type 2 diabetes. Some of these Hotongs are consumed immediately after harvesting and some are stored for a long time, ranging from freshly harvested to 24 months (2 years). During this storage time, the nutritional content of Hotong from Buru may decrease.

Agricultural foodstuffs contain a lot of nutrients necessary for human health. Carbohydrates, fats, proteins, vitamins, and minerals are nutrients needed by the body [5]. High carbohydrates will increase the supply of glucose to protect glycogen stores in the liver and help provide energy, fat, and protein metabolism and protect the protein from being used as an energy producer so that protein continues to function as a building block. Carbohydrates needed by adults are between 300-400 g per day. Ash is an inorganic substance leftover from the combustion of organic material. Ash content indicates the mineral content contained in a material [6]. Protein is a food substance that is very important
for the body because in addition to functioning as fuel in the body it also functions as a building and regulatory substance [7]. Protein functions to detoxify certain substances, for example, carbohydrates help the process of absorption of calcium in nucleic acids, digestion, cellulose, pectin, and lignin.

Hotong Buru (S. Italica) also contains fiber, where this fiber is very important in the digestion process by enzymes in humans. In Hotong Buru (S. Italica) fiber, there are polysaccharides in which there are chemical structures of cellulose, hemicellulose and lignin which play an important role in the process of human digestion.

The chemical structure of cellulose as depicted in Fig. 1 is a very long polymer, which is practically linear with glucose units bound by $\delta - 1$ and 1 bonds. Hydrogen bonds between parallel polymers form strong microfibrils. Cellulose micro fibrils provide the strength and rigidity required in the primary and secondary cell walls.

![Figure 2. Chemical Structure of Cellulose [8].](image)

Apart from cellulose, hemicellulose viewed in the image of Fig. 2 is also very important, where a heterogeneous group of compounds containing a number of sugars in the basic framework and side chains. Hemicellulose is a polysaccharide matrix that binds cellulose micro fibrils together and forms a covalent bond with lignin. It is essential for the formation of calcium (Ca) and Magnesium (Mg) complexes.

![Figure 3. Hemicellulose Structure [8].](image)

The fiber group found in Hotong Buru is insoluble fiber including cellulose, hemicellulose, and lignin. This fiber group tends to absorb water and increase compaction (Bulky) so that it contributes to a large volume of stool, insoluble fiber can increase gastro-intestinal peristaltic or can increase the speed of movement of material through the digestive tract to the colon.

Hotong seeds also contain bioactive components that have antioxidant properties, including vitamin E and tannins. Tannins are polyphenols and are one of the anti-nutrients contained in food. The impact of the presence of tannins in the formation of complex compounds with protein and carbohydrates tend to reduce protein digestibility. In addition to that, polyphenols can capture free radicals such as peroxynitrite and superoxide, so they play a role in resisting cell damage.

### IV. Conclusion

The results of the proximate analysis of 10 types of processed Hotong Buru culinary (S. Italica) states that it contains carbohydrate content with an average of 75.04, protein content with an average of 17.98, fat content
with an average of 6.54, and fiber content with an average of 3.67. This proves that the nutritional content of the Hotong Buru is very high and this culinary ingredient can be consumed as a staple food substitute for rice.

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Conflict of Interest Statement

The authors declare that they have no any conflicts of interest with another parties and authors either financial matter or idea.

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A Short CV of Corresponding author

Prof. Dr. Ali Awan, M.Kes is a professor from the biology education study program. He has done many international publications in the fields of entomology, microbiology, food nutrition, heavy metals, and pathology. The simplest research indicator recorded in scopus.com was the h index of 1. The best awards so far earned by Prof. Awan were from Mr. President, Ir. Joko Widodo of Indonesia namely as civil servant award of the Twentieth Year Satya Lancana Karya Satya.