

# CHAPTER I

## INTRODUCTION

### 1.1 Research Background

Primary school-age children are in a period of growth and development that requires food and nutrition to support the process. One problem with primary school children is their behavior and buying and consuming foods that do not contain enough nutrients.<sup>1</sup> Food consumed by elementary school children must be appropriately considered to fulfill nutrient intake. One habit of buying and consuming unhealthy foods is eating foods with high energy but low protein and fiber.<sup>2</sup> Protein deficiency in elementary school-aged children can result in suboptimal growth and development. Protein greatly affects the nutritional status of school-age children. Lack of protein intake in primary school children can affect the incidence of stunting in children.<sup>3</sup> According to Damayanti et.al 2020, protein intake in primary school children is 61.6% less than the Nutrition Adequacy Rate.<sup>4</sup>

Consumption of vegetables and fruits per day for the 5-9 year old group in a week according to the results of SKI 2023 is 67.7%<sup>5</sup> while the total consumption of vegetables and fruits is estimated at 82.78%.<sup>6</sup> Low fiber intake can lead to digestive system disorders such as constipation. The prevalence of constipation in children ranges from 0,3%-28% based on geographical factors.<sup>7</sup> According to the Nilfar 2023 research, nutritional problems in primary school-age children. Children prefer fried foods and snacks that make them full compared to main meals. Fried foods and snacks consumed by children contain high carbohydrate and fat content but low protein and fiber content, which

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<sup>1</sup> Prima Abresa, "Asupan Zat Gizi Makro, Makanan Jajanan, Dan Aktivitas Fisik Dengan Status Gizi Anak SD" 2, no. 1 (2023): 1–7.

<sup>2</sup> Arza Putri Aulia et al., "Edukasi Gizi Seimbang Dan Makanan Jajanan Sehat Di SDN 39 Pasar Ambacang Kota Padang" 3, no. 1 (2020): 30–37.

<sup>3</sup> Imran Tumenggung, Sri Yulan, and M. Anas Anasiru, "Asupan Karbohidrat Dan Protein Serta Kejadian Stunting Pada Anak Sekolah," *Journal Health and Nutritions* 7, no. 2 (2021): 50, <https://doi.org/10.52365/jhn.v7i2.573>.

<sup>4</sup> Amilia Yuni Damayanti et al., "Hubungan Asupan Makronutrien Dan Uang Saku Dengan Status Gizi Anak Sekolah Dasar," *Jurnal Gizi Prima (Prime Nutrition Journal)* 5, no. 1 (2020): 57–64.

<sup>5</sup> Kemenkes, "Survei Kesehatan Indonesia," 2023.

<sup>6</sup> BPN RI, *Rencana Aksi Badan Pangan Nasional Tahun 2023*, Badan Pangan Nasional, 2023, [https://badanpangan.go.id/storage/app/media/2023/Dokumen PPID Berkala 2023/Rencana Aksi Badan Pangan Nasional Tahun 2023.pdf](https://badanpangan.go.id/storage/app/media/2023/Dokumen_PPID_Berkala_2023/Rencana_Aksi_Badan_Pangan_Nasional_Tahun_2023.pdf).

<sup>7</sup> PGI, *Konsensus Penatalaksanaan Konstipasi Di Indonesia Revisi 2023*, 2023.

causes insufficient protein and fiber intake.<sup>8</sup> Some snacks that are often consumed by children while in the school environment include cimol, cilok, cilor, egg rolls, fried banana nuggets, sausage rolls, siomay and others.

Inadequate protein intake in elementary school children can lead to stunted growth, fatigue, impaired immunity and memory, and affect children's ability to concentrate while learning.<sup>9</sup> While inadequate fiber intake in elementary school children can impact nutritional problems ranging from constipation to obesity, improve concentration and focus in children and prevent the risk of future diseases.<sup>10</sup> Adequate nutrient intake is an aspect that needs to be considered for the development of elementary school-aged children.

Children aged 6-12 are very fond of snacking, food consumed between two meals.<sup>11</sup> One type of snack is biscuits. Biscuits are popular and favored by many people because of their delicious taste and crunchy. They can be consumed by all ages, from toddlers to school children to adults. Biscuits are pastry products made from wheat flour.<sup>12</sup> However, biscuits have low fiber and protein content, so it is necessary to modify the making of biscuits into functional foods so that it is necessary to consider the raw materials used. One of the local food ingredients that has high nutritional value is tempeh.<sup>13</sup>

Tempeh is one of the legume foods produced in Indonesia and is generally consumed every day, tempeh is also a food that is readily available and has an

<sup>8</sup> Merlin K. Halunuk Nilfar Ruaida, Wahyuni Sammeng, "Pola Makan Dan Status Gizi Anak Sekolah Dasar Di SD Inpres 36 Rumah Tiga" 7, no. 2 (2023): 305–15.

<sup>9</sup> Yessi Nurmalasari, Anggunan, and Indah Aullia Wulandari, "Hubungan Status Gizi Dengan Konsentrasi Belajar Pada Anak Sekolah Dasar Negeri 13 Teluk Pandan, Pesawaran," *Jurnal Dunia Kesmas* 9, no. 1 (2020): 147–54.

<sup>10</sup> Ufairoh Maliha Shofwah et al., "Correlation Between Fiber Intake and Energy Adequacy Based on 7-Days Food Diary of Primary School Children Age 8-12 Years in Surakarta," *Jurnal Dunia Gizi* 3, no. 1 (2020): 42, <https://doi.org/10.33085/jdg.v3i1.4654>.

<sup>11</sup> Siti Qorrotu Aini, "Perilaku Jajan Pada Anak Sekolah Dasar," *Jurnal Litbang: Media Informasi Penelitian, Pengembangan Dan IPTEK* 15, no. 2 (2019): 133–46, <https://doi.org/10.33658/jl.v15i2.153>.

<sup>12</sup> Dr. Andi Hudia Nurwahyuni, Dr. Slamet Widodo, "Inovasi Pembuatan Biskuit Dengan Substitusi Tempe Dan Analisis Kandungan Gizi" 5, no. 3 (2020): 248–53.

<sup>13</sup> Fihrina Mohamad et al., "Potensi Biskuit 'TYam' (Biskuit Dengan Substitusi Tepung Tempe Dan Serbuk Bayam) Sebagai Alternatif Pencegahan Stunting Pada Balita," *Journal Health & Science : Gorontalo Journal Health and Science Community* 5, no. 3 (2022): 51–61, <https://doi.org/10.35971/gojhes.v5i3.13797>.

economical price.<sup>14</sup> The protein content of tempeh is quite high, at 20,8 g per 100 g, and it contains 1,4 g of fiber.<sup>15</sup> Protein in tempeh can be used to meet protein needs in children who like to consume snacks with low protein content. Tempeh has a shelf life that is not durable. Therefore, to increase the shelf life of tempeh, it is necessary to reprocess it such as tempeh flour. The distinctive aroma of tempeh, light brown with fine grains characterizes tempeh flour. The protein content in tempeh flour per 100 g is 46 g, while fiber is 2,5 g.<sup>16</sup> The relatively high protein content in tempeh can increase the protein levels in tempeh flour-based products.<sup>17</sup> In a study by Latifah et al. (2019), the production of biscuits with the addition of tempeh flour resulted in a higher protein content compared to the quality standards for biscuits set by the Indonesian National Standard.<sup>18</sup>

Allah SWT mentions in surah Abasa verse 27 that beans are among the staple foods commonly consumed by humans.<sup>19</sup> One of the products made from legumes is tempeh. In addition to tempeh, local ingredients that contain high enough nutrients are gembili tubers. Gembili (*Dioscorea esculenta* L.) is one of the food crops that can be grown and developed throughout Indonesia. Gembili tubers are included in local tubers with a high fiber content of 6,386 g.<sup>20</sup> The water-soluble fiber in gembili tubers is obtained from high inulin, which is 14,77 g in 100 grams of gembili tubers.<sup>21</sup> Dietary fiber found in gembili

<sup>14</sup> Anisa Dewi Mentari, Budi Setiawan, and Eny Palupi, (2022)“Pengembangan RUTF (Ready To Use Therapeutic Food) Berbahan Sereal dan Kedelai Bagi Balita Malnutrisi Akut Berat,” *Media Gizi Indonesia (National Nutrition Journal)* 17, no. 1: 11–20, <https://ejournal.unair.ac.id/MGI/article/view/27651>.

<sup>15</sup> Kementerian Kesehatan RI, *Tabel Komposisi Pangan Indonesia* (Jakarta, 2020).

<sup>16</sup> Arifah Madani et al., (2023),“Analisis Kandungan Proksimat Cookies Tepung Tempe,” *Journal of Food Security and Agroindustry* 1, no. 2: 40–49, <https://doi.org/10.58184/jfsa.v1i2.87>.

<sup>17</sup> Pramita Ayu Winarti et al., “Formulasi Biskuit Sebagai Makanan Tambahan Balita Gizi Kurang Menggunakan Tepung Tempe,” *Media Gizi Kesmas* 13, no. 1 (2024): 352–61, <https://doi.org/10.20473/mgk.v13i1.2024.352-361>.

<sup>18</sup> Evitha Latifah, Setyaningrum Rahmawaty, and Rusdin Rauf, “Biskuit Garut-Tempe Tinggi Energi Protein Sebagai Alternatif Snack Untuk Anak Usia Sekolah; Analisis Kandungan Energi Protein Dan Daya Terima,” *Darussalam Nutrition Journal* 3, no. 1 (2019): 19, <https://doi.org/10.21111/dnj.v3i1.3140>.

<sup>19</sup> M. Abdul Ghoffar, Abdurrahim Mu'thi, and Abu Ihsan Al-Atsari, *Tafsir Ibnu Katsir*, ed. M. Yusuf Harun et al., *Sustainability (Switzerland)*, Ke-3, vol. 11 (Bogor: Pustaka Imam Asy-Syafi'i, 2004).

<sup>20</sup> Dina Yuniar, “Karakteristik Beberapa Umbi Uwi (*Dioscorea* Spp.) Dan Kajian Potensi Kadar Inulinnya,” [*Skripsi*], 2010, Fakultas Teknologi Industri Universitas Pembangunan.

<sup>21</sup> Sri Winarti, Eni Harmayani, and Rudi Nurismanto, “Karakter Dan Profil Inulin Beberapa Jenis Uwi (*Dioscorea* Spp.),” *Agritech* 31, no. 4 (2021): 378–83.

tubers has health benefits, including maintaining body metabolism, preventing gastrointestinal disorders, improving immunity, improving brain function and concentration as well as a healthy and gluten-free food alternative.<sup>22</sup> In addition to high fiber, gembili bulbs also contain 1,1 g of protein.<sup>23</sup>

Gembili contains water-insoluble polysaccharides. Gembili has the highest yield of tuber flour and starch flour (24.28% and 21.44%)<sup>24</sup> compared to other tubers. Hence, Gembili tubers have the potential to be developed into flour and applied to biscuits, which are known and preferred by the public. One of the things that can be done to enrich nutrients in biscuits is through food innovation, in addition to adding nutrients to biscuits, innovation can also be of economic value by adding local ingredients.<sup>25</sup>

The previous description explains that wheat flour commonly used for biscuits can be replaced with tempeh flour and gembili flour to improve their protein and fiber content. Therefore, researchers will make biscuit innovations with the addition of tempeh flour and gembili flour and analyze the protein, fiber, and organoleptic content of biscuit innovations substituting tempeh flour and gembili flour.

## 1.2 Research Problem

Are there differences in protein content, fiber content and organoleptic values of biscuits when substitution tempeh flour and gembili flour?

## 1.3 Research Objectives

### 1. General Purpose

Analysis of the differences in protein content, fiber and organoleptic value in variations of biscuits substitution with tempeh flour and gembili flour.

### 2. Special Purpose

<sup>22</sup> Mujianto Mujianto et al., "Dietary Fiber as a Good Functional Food Source (Thoyyib) for Digestion," *Jurnal Penelitian Ilmu-Ilmu Teknologi Pangan* 12, no. 2 (2023): 7–13, <https://jurnal.um-palembang.ac.id/edible/article/view/7350/3809>.

<sup>23</sup> Kementerian Kesehatan RI, *Tabel Komposisi Pangan Indonesia*.

<sup>24</sup> Yuwono Setiadi Arintina Rahayu, Cahyo Hunandar, "Aplikasi Inulin Umbi Gembili (*Dioscorea esculenta*) Pada Produk Roti Manis Untuk Peningkatan Kadar Serat, Sifat Fisik, Dan Tingkat Penerimaan" 3 (2020): 499–506.

<sup>25</sup> Nurwahyuni, Dr. Slamet Widodo, and Dr. Andi Hudia, (2019) "Inovasi Pembuatan Biskuit Dengan Substitusi Tempe Dan Analisis Kandungan Gizi," *Universitas Negeri Makassar* 2, no. 3.

- a. Analyzing differences in protein content in variations of biscuits substituted with tempeh flour and gembili flour.
- b. Analyzing differences in fiber content in biscuit variations with substitutions of tempeh flour and gembili flour.
- c. Analyzing differences in organoleptic values on variations of biscuit with substitutiona of tempeh flour and gembili flour

#### 1.4 Research Benefits

##### 1. Theoretical Benefits

This research is expected to increase knowledge and add insight for readers regarding differences in the value of protein content and fiber content in variations of biscuits substituted with tempeh flour and gembili flour.

##### 2. Practical Benefits

###### a. Researcher

This research provides hands-on experience in making local food-based products. Researchers can also expand their knowledge of nutrient analysis techniques, which will be useful for the development of future food innovations.

###### b. Student

Students who are interested in food and nutrition innovation can use this research as a reference, students can also understand how to analyze protein, fiber and organoleptic levels of a product, and understand the importance of developing functional foods based on local food ingredients.

###### c. Public

The biscuits in this study can be an alternative healthy snack for elementary school children that can help meet children's nutritional needs. By utilizing local food ingredients, this research contributes to reducing dependence on imported wheat flour.

#### 1.5 Authenticity Research

Table 1. Authenticity Research

No	Research Title	Type of Research	Variable	Result	Research Differences
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1	Potential of “Tyam” Biscuits (Biscuits with Tempeh Flour Substitution and Spinach Powder) as an Alternative to Prevent Stunting in Toddlers <sup>26</sup>	Experimental	Independent: “Tyam” biscuits with added tempeh flour and spinach powder  Dependent: Fat, Carbohydrate, Protein, Fiber PUFA, Vitamin A, Vitamin E, Vitamin B6, Total Folic Acid, Potassium, Magnesium, Phosphorus, Ferrous and Zinc.	“Tyam” biscuits with substitutions of tempeh flour and spinach powder have the potential as an alternative to stunting prevention because they contain nutritional values (Fat content, carbohydrates, PUFA, Vitamin A, Vitamin E, Vitamin B6, Total Folic Acid, Potassium, Magnesium, Phosphorus, Ferro, and Zinc) that are better than ordinary biscuits.	Independent: biscuits with gembili flour substitution
2	Proximate Content Analysis of Tempeh Flour Cookies <sup>27</sup>	Experimental	Independent: Comparison of tempeh flour substitution (25% wheat flour: 75% tempeh flour, 50% wheat flour: 50% tempeh flour, 75% wheat flour: 25% tempeh flour)  Dependent: analysis of moisture content, ash content, carbohydrate content, total fat content, protein content, crude fiber content, organoleptic test	Organoleptic testing showed the highest value in treatment F3 (75% wheat flour: 25% tempeh flour) of 5.50 (somewhat like). In addition, the organoleptic test results showed different average values between the F1, F2, and F3 treatments on the color, aroma, taste and texture parameters.	Independent: biscuits with substitution of tempe flour and gembili flour  Dependent: total fiber content
3	Effect of Gembili ( <i>Discorea esculenta</i> ) Flour	Experimental (RAL)	Independent: substitution of gembili flour in making cookies	Cookies with gembili flour substitution showed a significant effect	Independent: biscuits with substitution of tempeh flour

<sup>26</sup> Fihrina Mohamad et al., (2022) “The Potential of ‘Tyam’ Biscuit (Biccuit With Tempe Flour and Spinning Powder Substitution) As Alternative To Prevent Stunting in Toddlers,” *Journal Health & Science: Gorontalo Journal Health and Science Community* 5, no. 3: 51–61, <https://doi.org/10.35971/gojhes.v5i3.13797>.

<sup>27</sup> Madani et al., “Analisis Kandungan Proksimat Cookies Tepung Tempe.”

	Substitution on Cookies Characteristics <sup>28</sup>		with various ratios to wheat flour  Dependent: moisture content, crude fiber, and hedonic test	on moisture content, crude fiber, and hedonic parameters (taste, aroma, texture, and color) of cookies. The test results showed that the treatment with the ratio of wheat flour: 100:50 gembili flour produced the most favorable cookie characteristics by panelists.	and gembili flour  Dependent: total protein and fiber content
4	Innovation in Biscuit Making with Tempeh Substitution and Analysis of Nutritional Content <sup>29</sup>	Experimental	Independent: substitution of tempe flour in biscuits  Dependent: analysis of protein, fat, carbohydrate, water, ash, zinc, and calcium content	The organoleptic test of the liking quality of the selected FT3 30% tempe flour substitution biscuits showed differences in color, aroma, texture, taste, overall, and hedonic test. The results of the FT3 selected tempe flour biscuit nutritional content test showed a protein value of 10.28%, fat 10.42%, carbohydrates 77.35%, water 4.55%, ash 10%, zinc 15.64 mg/kg, and calcium 0.67%.	Independent: biscuits with substitution of tempeh flour and gembili flour  Dependent: dietary fiber content
5	High Protein Energy Arrowroot-Tempeh Biscuits as an Alternative Snack for	Experimental	Independent: Comparison of Tempe flour substitution in biscuit making, namely 20%, 25%, and 30%	The results showed that biscuits with tempe flour substitution had a higher protein content compared to the quality	Independent: biscuits with substitution of tempeh flour and gembili flour

<sup>28</sup> R Wardani, A Utami, and R Ulfa, "Pengaruh Substitusi Tepung Gembili ( Dioscorea Esculenta ) Terhadap Karakteristik Cookies," *Jurnal Teknologi Pangan* 5, no. 1 (2023): 8–14.

<sup>29</sup> Nurwahyuni, Dr. Slamet Widodo, "Inovasi Pembuatan Biskuit Dengan Substitusi Tempe Dan Analisis Kandungan Gizi."

School-Age  
Children<sup>30</sup>

Dependent:  
Energy and  
protein content of  
biscuits and  
acceptability of  
biscuits by  
children.

requirements of  
biscuits according  
to SNI, with  
protein levels  
about 1.23 times  
1.39 times and  
1.67 times higher,  
respectively.  
Panelists most  
favored Biscuit A.

Dependent:  
dietary fiber  
content



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<sup>30</sup> Latifah, Rahmawaty, and Rauf, "Biskuit Garut-Tempe Tinggi Energi Protein Sebagai Alternatif Snack Untuk Anak Usia Sekolah; Analisis Kandungan Energi Protein Dan Daya Terima."