

CHAPTER I

INTRODUCTION

1.1 Research Background

Adolescence is a transitional period from childhood to adulthood, commonly referred to as puberty. This transitional period renders adolescents, particularly teenage girls, vulnerable to nutritional problems, one of which is iron deficiency, which can lead to anemia.¹ Anemia is caused by a low red blood cell count or reduced hemoglobin (Hb) concentration, which diminishes the blood's capacity to transport oxygen.²

According to the World Health Organization (WHO), the prevalence of iron deficiency anemia among adolescent girls was 29.9% in 2019.³ Based on the 2013 Basic Health Research, the prevalence of anemia among adolescent girls over the age of 15 in Indonesia was 22.7%, rising to 32% in 2018.^{4, 5} According to the East Java Provincial Health Office, the prevalence of iron deficiency anemia among adolescent girls was 19.6%.⁶ Meanwhile, according to the Ngawi District Health Office, the incidence of iron deficiency anemia among adolescent girls was 57.1%.⁷

One factor contributing to anemia in adolescent girls is inadequate dietary intake, which includes an unhealthy diet that neglects sources of protein, vitamins, and minerals while consuming high-energy but low-fiber foods. According to the 2023 Indonesian Health Survey (IHS), 16.9% of children over 10 still consumed few vegetables and fruits.⁸ Strategies to

¹ Riesky Budi Nurhidayati. 2024. Hubungan Pengetahuan, Gizi, Sikap Terhadap Kesehatan Remaja Khususnya Anemia. SIMFISIS: Jurnal Kebidanan Indonesia. 744–53.

² BKKBN. No Title. Remaja dan Permasalahannya, dinkes 28 Februari 2019.

³ World Health Organization (WHO), 2019.

⁴ Badan Penelitian dan Pengembangan Kesehatan. Riset kesehatan dasar (RISKESDAS) 2013. 2013:1-384.

⁵ Kemenkes RI. Hasil Riset Kesehatan Dasar Tahun 2018. Kementerian Kesehat RI. 2018;53(9):168999.

⁶ Dinas Kesehatan Jawa Timur. 2020. Profil Kesehatan Provinsi Jawa Timur

⁷ Dinas Kesehatan Ngawi. 2021. Profil Kesehatan Ngawi.

⁸ Kementerian Kesehatan. Survey Kesehatan Indonesia. 2023.

enhance the diet of adolescents with anemia include consuming nutritious snacks that contain dietary fiber, high protein, and iron.⁹

A snack can be defined as food or drink consumed as a light meal between regular meals.¹⁰ One of the snacks preferred by teenagers is the snack bar.¹¹ Some advantages of snack bars include their practical form (bar-shaped and compact), which makes them easy for everyone to consume. Furthermore, snack bars are rich in nutrients and possess a relatively long shelf life.¹² The primary ingredients for producing snack bars typically include cereals, nuts, and dried fruits.¹³

Soybeans are a type of legume known for their high protein content, which can stimulate the production of red blood cells and serve as an alternative to help prevent anemia.¹⁴ The utilization of soybeans as a food ingredient often involves processing them into flour, thus allowing soybeans to be used in various ways to create a wide range of food products.¹⁵ Utilizing soy flour is one method to provide a high-protein food source. The nutritional content of soy flour per 100 grams includes 347 kcal of energy, 29.9 g of

⁹ Anggray Duvita Wahyani and Yuniarti Dewi Rahmawati. 2021. Analisis Kandungan Serat Pangan dan Zat Besi pada Cookies Substitusi Tepung Sorghum Sebagai Makanan Alternatif Bagi Remaja Putri Anemia. JKM (Jurnal Kesehatan Masyarakat) Cendekia Utama. 8.2. p. 227, doi:10.31596/jkm.v8i2.685.

¹⁰ Vadira Rahma Sari and others. 2023. Pengaruh Pemberian Snack Cup Pisang, Kurma, dan Madu Terhadap Hemoglobin Remaja Putri Anemia. Gizi Indonesia. 46.1, pp. 77–86, doi:10.36457/gizindo.v46i1.808.

¹¹ Dylla Hanggaeni Dyah Puspaningrum, Ida Ayu Ida Srikulini, and Ni Ketut Wiradnyani. 2019. Penambahan Tepung Daun Kelor (*Moringa Oleifera*) Dan Tepung Kacang Kedelai (*Glycine Max. L*) Terhadap Nilai Gizi Snack Bar'. *Pro Food*. 5.2. pp. 544–48, doi:10.29303/profood.v5i2.115.

¹² Buah Hamonangan Simanjorang, Vanny Setiaries Johan, and Rahmayuni Rahmayuni. 2020. Pemanfaatan Tepung Biji Nangka Dan Sale Pisang Ambon Dalam Pembuatan Snack Bar'. *Jurnal Agroindustri Halal*. 6.1. pp. 001–010. doi:10.30997/jah.v6i1.2164.

¹³ Christi Eva Listyaningrum, Dian Rachmawanti Affandi, and M Zukhrufuz Zaman. 2018. Pengaruh Palm Sugar Sebagai Pengganti Sukrosa Terhadap Karakteristik Snack Bar Tepung Komposit (Ubi Ungu, Jagung Kuning Dan Kacang Tunggak) Sebagai Snack Rendah Kalori'. *Jurnal Teknologi Hasil Pertanian*. XI. pp. 53–62.

¹⁴ Annisa Lutfiah, Annis Catur Adi, and Dominikus Raditya Atmaka. 2021. Modifikasi Kacang Kedelai (*Glycine Max*) Dan Hati Ayam Pada Sosis Ayam Sebagai Alternatif Sosis Tinggi Protein Dan Zat Besi'. *Amerta Nutrition*. 5.1. p. 75. doi:10.20473/amnt.v5i1.2021.75-83.

¹⁵ Kadek Boby Prasetya and Gusti Ayu Pramatinah. 2024. Penggunaan Tepung Kacang Kedelai Dalam Pembuatan Swiss Roll Cake. *Jurnal Ilmiah Pariwisata Dan Bisnis*. 3.1. pp. 99–103, doi:10.22334/paris.v3i1.692.

carbohydrates, 20.6 g of fat, 35.9 g of protein, 5.8 g of fiber, 195 mg of calcium, and 8.4 mg of iron. Furthermore, soy flour contains various vitamins, including vitamins A, B, and C.¹⁶

In addition to soybeans, moringa leaves (*Moringa oleifera* L.) are also a source of iron, which can aid in the formation of red blood cells.¹⁷ Moringa leaves are classified as a vegetable that can be utilized as a food source and in product development.¹⁸ Although moringa leaves could be consumed, only a few people in Indonesia consumed them because they were not widely favored. Consequently, moringa leaves can be processed into a semi-finished product known as moringa leaf flour, which can then be utilized to create various food and beverage options.¹⁹

Moringa leaf flour is derived from dried moringa leaves that are ground into a fine powder.²⁰ The nutritional content of moringa leaf flour per 100 g included 38.2 g of carbohydrates, 27.1 g of protein, 2.3 g of fat, and 19.2 g of fiber.²¹ Khofifah et al.'s 2023 study of anemic adolescent girls at Pondok Pesantren Hufadzul Qur'an Al Asror Semarang, who were given 18 grams (2 pieces) of moringa leaf biscuits per day for 14 days, showed that moringa leaf biscuits increased hemoglobin levels in these girls.²²

¹⁶ Kementerian Kesehatan RI. Data Komposisi Pangan Indonesia (Online). Jakarta: Kemenkes RI. 2019. Diakses dari <https://www.panganku.org/id-ID/view>

¹⁷ Yuni Astuti and Lia Idealistiana. 2024. Efektivitas Teh Daun Kelor Terhadap Peningkatan HB Pada Remaja Putri Dengan Anemia. *Malahayati Nursing Journal*. 6.7. pp. 2644–55, doi:10.33024/mnj.v6i7.11418.

¹⁸ Asiska Permata and Sarah Fadila. 2024. Formulasi Gel Ekstrak Daun Kelor (*Moringa Oleifera* Lam.) Serta Uji Karakteristik Sediaan Dan Uji Cemaran Mikrobiologi Abstrak Pendahuluan. *Journal of Pharmaceutical and Sciences Electronic*. pp. 308–15.

¹⁹ Freddi Sarman and others. 2024. Pendampingan Masyarakat Dalam Pengolahan Mie dan Teh Daun Kelor. *BERNAS: Jurnal Pengabdian Kepada Masyarakat*. 5.1. pp. 720–24.

²⁰ Winarno, F. G. 2018. Tanaman Kelor (*Moringa Oleifera*) Nilai Gizi, Manfaat dan Potensi Usaha. Gramedia.

²¹ Yosfi Rahmi and others. 2019. 'Profil Mutu Gizi, Fisik, Dan Organoleptik Mie Basah Dengan Tepung Daun Kelor (*Moringa Oleifera*)'. *Indonesian Journal of Human Nutrition*. 6.1. pp. 10–21. doi:10.21776/ub.ijhn.2019.006.01.2.

²² Nur Khofifah and Mardiana Mardiana. 2023. 'Biskuit Daun Kelor (*Moringa Oleifera*) Berpengaruh Terhadap Kadar Hemoglobin Pada Remaja Putri Yang Anemia'. *AcTion: Aceh Nutrition Journal*. 8.1. p. 43, doi:10.30867/action.v8i1.614.

Based on the identified issues, research needs to be conducted titled “Innovation of Snack Bars With Substitution of Soy Flour and Moringa Leaf Flour as Snacks for Adolescents with anemia”. The production of snack bars utilizing soy flour and moringa leaf flour is anticipated to provide a healthy snack alternative contains dietary fiber, high in protein, and abundant in iron.

1.2 Research Problems

Was there a difference in protein content, dietary fiber, iron levels, and organoleptic test results in the formulation of snack bars by substituting soy flour and moringa leaf flour as a snack for adolescents with anemia?

1.3 Research Objectives

1. General Purpose

Analyzed the protein content, dietary fiber, iron, and organoleptic test in the snack bar formulation with soy flour and moringa leaf flour substitution as a snack for adolescents with anemia.

2. Special Purpose

- 1) Analyzed the difference in protein content in the snack bar formulation with soy flour and moringa leaf flour substitution as a snack for adolescents with anemia.
- 2) Analyzed the difference in dietary fiber content in the snack bar formulation with soy flour and moringa leaf flour substitution as a snack for adolescents with anemia.
- 3) Analyzed the difference in iron content in the snack bar formulation with soy flour and moringa leaf flour substitution as a snack for adolescents with anemia.
- 4) Analyzed an organoleptic test on the snack bar formulation with soy flour and moringa leaf flour substitution as a snack for adolescents with anemia.

1.4 Research Benefits

1. Theoretical Benefits

Theoretically, this research is expected to enrich and provide insights for developing science and technology, particularly in functional foods using soy flour and moringa leaf flour, which are rich in protein, dietary fiber, and iron content, as an alternative snack for adolescents with anemia.

2. Practical Benefits

The results of this study can be used as a reference for future research on food innovation utilizing functional food ingredients such as soybeans and moringa leaves.

1.5 Authenticity Research

Research related to snack bars with several raw material variations in their production has been conducted by several researchers, as shown in Table 1 of this study.

Table 1. Authenticity Research

Research Title	Research Method	Variable	Result	Research Differences
Study on the Production of Snack Bars with Soy Flour and Red Amaranth Leaf Flour as a Snack to Prevent Anemia ²³	Laboratory experimental method with a Completely Randomized Design (CRD) using five treatment formulations.	Independent: Soy flour and red amaranth flour snack bars Dependent: Organoleptic test and chemical analysis test	The snack bar formulation at 5% is the best product. The organoleptic test results show an average score of color (7.21), taste (6.49), aroma (6.62), and texture (6.13). The chemical analysis results for the best treatment show a protein content of 15.7%, fat of 26.78%, carbohydrates 48.44%, energy of 497.93 kcal, moisture content of 8.96%, iron of 1.65 mg, and ash of 0.0327%.	Independent variable: Snack bar with soy flour and moringa leaf flour substitution. Dependent variables: Analysis of protein content, dietary fiber, iron content, and organoleptic test.
Formulation of Snack Bars Based on Soy Flour (<i>Glycine max</i> L.) and	Experimental with a Completely Randomized	Independent: Snack bar with soy flour and pumpkin flour	The snack bar with the highest energy content is F3, which contains 2.53% ash, 30.62% moisture, 14.45% protein, 17.09%	Independent variable: Snack bar with soy flour and moringa leaf flour substitution.

²³ Huda Oktafa Melynda Ayyu Khaffifah, 'Studi Pembuatan Snack Bar Tepung Kedelai Dan Tepung Bayam Merah Sebagai Makanan Selingan Untuk Mencegah Anemia'. HARENA : Jurnal Gizi, 3.1, pp. 10–19.

Research Title	Research Method	Variable	Result	Research Differences
Pumpkin Flour (<i>Cucurbita moschata</i> Dorch) as an Alternative Energy Source Food ²⁴	Design (CRD).	Dependent: Ash content test, moisture content test, protein content test, fat content test, carbohydrate content test, energy test, and acceptance test.	total fat, 35.30% carbohydrates, and a total energy of 352.83 kcal/100 grams. The acceptance test results show that the most preferred color is F3, the aroma is preferred for F1, and both taste and texture are selected for F3.	Dependent variables: Analysis of protein content, dietary fiber, iron content, and organoleptic test.
Substitution of Soy Flour (<i>Glycine max</i> L.) and Raja Banana (<i>Musa paradisiaca</i> L. var. <i>sapientum</i>) on the Chemical, Nutritional, and Organoleptic Quality of Snack Bars for Hypertensive Patients ²⁵	Experiment with a Completely Randomized Design (CRD) using four treatment levels	Independent: Snack bar with soy flour and Raja banana flour Dependent: Chemical quality, nutritional quality, and organoleptic quality.	Substituting wheat, soy, and Raja banana flour in the snack bar significantly affects moisture content. However, it does not significantly affect ash content, protein, fat, carbohydrates, energy value, potassium content, color, aroma, taste, and texture.	Independent variable: Snack bar with soy flour and moringa leaf flour substitution. Dependent variables: Analysis of protein content, dietary fiber, iron content, and organoleptic test.
The Addition of Moringa Leaf Flour (<i>Moringa oleifera</i> *) and Soy Flour (<i>Glycine max</i> * L.) to the Nutritional Value of Snack Bars ²⁶	Experimental research with a Completely Randomized Design (CRD)	Independent: Snack bar with moringa leaf flour and soy flour Dependent: Nutrient content analysis	The research results showed that the higher the addition of soy flour, the more it affects the protein and fat content. The addition of moringa leaf flour influences the iron content.	Independent variable: Snack bar with soy flour and moringa leaf flour substitution. Dependent variables: Analysis of protein content, dietary fiber, iron content, and organoleptic test.
The Effect of Moringa Leaf Flour (<i>Moringa</i>	This experimental research	Independent: Snack bar with moringa leaf	The organoleptic analysis results of the hedonic test show that the selected	Independent variable: Snack bar with soy flour

²⁴ Syahrina Maulida Majid and Eko Farida. 2022. Formulasi Snack Bar Berbahan Dasar Tepung Kedelai (*Glycine Max* L.) dan Tepung Labu Kuning (*Cucurbita Moschata* Dorch) Sebagai Makanan Alternatif Sumber Energi Syahrina. Indonesian Journal of Public Health and Nutrition. 4.2. pp. 217–24.

²⁵ Maryam Razak, I Komang Suwita, and Yuan Dika Damayanti. 2024. Substitusi Tepung Kacang Kedelai (*Glycine Max* L.) dan Pisang Raja (*Musa Paradisiaca* L. Var *Sapientum*) Terhadap Mutu Kimia, Mutu Gizi dan Mutu Organoleptik Snack Bar Bagi Penderita Hipertensi. Media Gizi Pangan. 31.1. pp. 101–11, doi:10.32382/mgp.v31i1.353.

²⁶ Puspaningrum, Srikulini, and Wiradnyani. 2019.

Research Title	Research Method	Variable	Result	Research Differences
<i>oleifera</i> Lam.) Substitution on the Organoleptic Properties and Calcium Content of Snack Bars ²⁷	design uses a Completely Randomized Design (CRD) with one control and three substitutions.	flour substitution Dependent: Organoleptic properties and calcium content.	snack bar formula is F2. The proximate analysis of the snack bar chosen shows a moisture content of 12.52%, ash content of 1.65%, fat content of 19.61%, protein content of 9.23%, carbohydrate content of 56.99%, and a calcium content of 344.14 mg/100g.	and moringa leaf flour substitution. Dependent variables: Analysis of protein content, dietary fiber, iron content, and organoleptic test.



²⁷ Septiani Fahlia, Nur. 2020. Pengaruh Substitusi Tepung Daun Kelor (*Moringa Oleifera* Lam.) Terhadap Sifat Organoleptik dan Kadar Kalsium Snack Bar. Jurnal Gizi dan Pangan Soedirman. 4.2. p. 216, doi:10.20884/1.jgipas.2020.4.2.2794.