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Nutritional Analysis of Avocado Seed Flour Nuggets in Reducing Stunting

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ABSTRACT

Stunting is a condition where the growth of children under five is hampered due to a continuous lack of nutritional intake, which results in their height not being appropriate for their age. The short-term impact of stunting is increased morbidity and mortality rates, impaired growth, and increased burden of care and treatment costs. This study aimed to analyze about the nutritional value contained in avocado seed flour nuggets with chicken, catfish, and shrimp variants, especially the protein and calcium content. This study uses two research methods, namely descriptive and experimental methods. The aim of the descriptive method in this research was to explain the results of the nutritional content in avocado seed flour nuggets. The experimental method used in this research was to determine the nutritional content of protein and calcium in avocado seed flour at the Medan Center for Standardization and Industrial Services Laboratory using the Atomic Absorption Spectroscopy (AAS) method, referring to the SNI 01-2891-1992 procedure. Laboratory tests revealed the highest protein content in the chicken variant at 11.1%, followed by the shrimp variant at 10.3%, and the catfish variant at 9.57%. Meanwhile, the highest calcium (Ca) content was found in the catfish variant at 408 mg/kg, shrimp at 227 mg/kg, and chicken at 45.3 mg/kg.. Based on the results of nutritional content testing at the Medan Research and Standardization Center, the amount of protein and calcium content of avocado seed flour nuggets can meet 20% of the protein and calcium needs of toddlers.

Keywords : Avocado Seeds; Calcium; Nuggets; Proteins; Stunting

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INTRODUCTION

In many underdeveloped nations, malnutrition—which includes underweight, stunting, wasting, and micronutrient deficiencies—is a common concern.[1] A crucial health indicator is nutritional status, particularly for children who are susceptible to malnutrition issues, particularly stunting. Toddlers who experience stunting, a disease of growth failure brought on by a persistent lack of nourishment, have heights below average for their age. Growth abnormalities, higher rates of morbidity and mortality, and higher care and treatment expenses are the immediate effects of stunting. Long-term hazards can lead to reproductive issues, learning difficulties, and reduced productivity at work.[2]

The incidence of stunting decreased from 24.4% to 21.6%, with a prevalence of 21.1% in North Sumatra alone, according to the findings of the 2022 Indonesian Nutritional Status Survey (SSGI). Despite the decrease, this number is still regarded as excessive because the World Health Organization (WHO) norm is less than 20% and the target prevalence of stunting in 2024 is 14%. Indonesia ranks second in the ASEAN area for the prevalence of stunting.[3]

The World Health Organization states that if a child's height-for-age (TB/U) or length-for-age (PB/U) index falls below the child growth standards limit (z-score) of less than -2 SD, stunting can be diagnosed. According to WHO research, a number of factors contribute to toddler stunting in Indonesia, including inadequate breastfeeding, low economic status, premature birth, low birth weight babies, mothers with low levels of maternal education, and not receiving exclusive breastfeeding.[4] If left untreated, stunting can eventually affect a person's physical development, mental well-being, IQ, and cognitive capacities. Stunting in toddlers who are five years old will be difficult to recover from, and it is likely to continue into adulthood, raising the risk of low birth weight (LBW) kids..[5]

Growth retardation is a condition that frequently goes unnoticed by the general public since it lacks obvious indicators like sickness symptoms. A common misconception is that short stature is caused by genetics. The quality of a child's growth is greatly influenced by the genetic instructions found in egg cells. Stunting in children can still be rectified by factors like illness or starvation that caused the parents to be short as children. The chance of inheriting the short height gene is higher, nevertheless, if the parents' low stature is caused by genetic elements that control short stature in the chromosomes. Because of this, stunting is challenging to overcome.[6] However, hereditary variables account for just 15% of the variation in height, but nutritional factors account for a larger portion. Adults who experience delayed growth may be more susceptible to chronic illnesses. Therefore, in order to break the stunting cycle in the life cycle, measures to combat stunting must be initiated from the first 1000 days of life until puberty. [7]

The main dietary components that give the human body the most energy are macronutrients.[8] Micro and macronutrients are necessary for growth and can aid in children's development. Among the macronutrients that are crucial to growth are calcium and protein. Based on the findings of the study, it was determined that children who suffer from stunting consume much less protein, calcium, and phosphorus than children who do not. As a result, toddlers' macronutrient requirements—particularly

for those who are stunting—are crucial for promoting their growth and lowering their risk of health issues.[9]

Consuming adequate animal protein can prevent stunting because it contains important amino acids, which are micronutrients that the body desperately needs. Certain amino acids are essential since the body is unable to synthesize them and must only get them from diet.[10] In order to activate growth hormones and enzymes that help avoid stunting, this amino acid is required. In addition to enhancing food quality, animal-based protein improves nutritional status and a number of other health factors, including growth, brain function, physical activity, and academic performance in developing nations. Our surroundings contain a variety of animal protein sources. Red meat, fish, poultry, and shrimp are examples of animal protein sources that are essential for healthy baby growth and can help avoid stunting.[11]

In addition to protein, calcium plays a significant function in preventing stunting. The mineral calcium is essential for the body's metabolism, nerve-to-nerve communication, heart rate, and muscular contraction among other processes.[12] The requirement for bone mineralization rises significantly during the growing phase. A lack of calcium can impact osteoblast function and lead to less mineral addition to newly formed bone structures. Furthermore, it can impact bone development, leading to childhood rickets, and if the deficit is severe, it can result in stunting.[13]

According to the description, the author wants to increase the protein and calcium content of avocado seed flour nugget products by using laboratory experiments on flavor variations of chicken, catfish, and shrimp that have already been developed and organoleptically tested.

METHOD

There are two methods used in this research, namely descriptive and experimental methods. The descriptive method in this research aims to explain the results of the nutritional content in avocado seed flour nuggets. The experimental method in this study was to analyze the nutritional content of protein and calcium in avocado seed flour at the Medan Industrial Standardization and Services Center Laboratory using the Atomic Absorption Spectroscopy (AAS) method, referring to the SNI 01-2891-1992 procedure.

The raw material in this research is avocado seeds, which will be processed into avocado seed flour to be made into avocado seed flour nuggets. The tools used for grinding avocado seeds are a container, a knife, a spoon, a fine sieve, a blender, an oven, scales, and a baking tray.

The stages in this research are (1) Making avocado seed flour, the avocado seeds are cut into small pieces, then dried in an oven at a temperature of 150C^{o} for 2 hours. After the seeds are dry, they are ground into flour using a blender. The avocado seed flour is then stored in a tightly closed container before use. (2Making avocado seed flour nuggets, prepare the ingredients and tools, and weigh the ingredients needed according to the size, such as avocado seed flour, tapioca flour, and chicken/catfish/shrimp meat. Then mix the ingredients such as carrots, soup leaves, finely chopped

garlic and eggs. Then, stir the mixture until evenly combined. Once the mixture is ready, steam it for about 10 minutes, let it cool, then cut the nuggets into pieces and separate each flavor. Coat the nuggets in dry flour, water, then breadcrumbs, after which the nuggets are ready to be served.

RESULT

Avocado seed flour nuggets have good nutritional content for health. The results obtained from the analysis of several nutritional content of avocado seed flour nuggets conducted at the Medan Industrial Research and Standardization Center, specifically for avocado seed flour nuggets in chicken, catfish, and shrimp variants, are shown in the table below:

Table 1. Nutritional Content Results of Chicken Variant Avocado Seed Flour Nuggets

No.	Parameter	Unit	Result	Metodh
1.	Proteins	%	11,1	SNI 01-2891-1992
2.	Calcium (Ca)	mg/kg	45,3	AAS

Based on table 1, it explains that the results of the analysis of the nutritional content of avocado seed flour nuggets with chicken variant are that the protein content is 11.1% and the calcium (Ca) content is 45.3 mg/kg.

Table 2. Nutritional Content Results of Catfish Variant of Avocado Seed Flour Nuggets

Parameter	Unit	Result	Metodh
Proteins	%	9,57	SNI 01-2891-1992
Calcium (Ca)	mg/kg	408	AAS

Table 2 explains that the results of the analysis of the nutritional content of avocado seed flour nuggets with catfish variant are that the protein content is 9.57% and the calcium (Ca) content is 408 mg/kg.

Table 3. Nutritional Content Results of Shrimp Variant of Avocado Seed Flour Nuggets

Parameter	Unit	Result	Metodh
Proteins	%	10,3	SNI 01-2891-1992
Calcium (Ca)	mg/kg	227	AAS

Table 3 explains that the results of the analysis of the nutritional content of the shrimp variant avocado seed flour nuggets are that the protein content is 10.3% and the calcium (Ca) content is 227 mg/kg.

DISCUSSION

The Medan Industrial Research and Standardization Center's laboratory results indicate that the protein and calcium content of avocado seed flour nuggets vary. Calcium intake of 1000–1200 mg and protein intake of 65–70 grams per day are considered nutritionally adequate. Only 20% of the required 13 grams of protein and 240 mg of calcium can be met by these avocado seed flour nuggets because they are meant to be snacks. According to the findings of the protein test conducted on chicken nuggets in 85 grams of dough using SNI 01-2891-1992, avocado seed flour nuggets contribute 11.1% of the protein. Thus, the avocado seed flour nuggets can satisfy daily protein needs by eating three pieces of chicken nuggets. The avocado seed flour nuggets can satisfy daily protein requirements by eating five pieces of catfish nuggets, which account for 9.57% of the protein content. You can fulfill your daily protein requirements by eating four pieces of shrimp variation avocado seed flour nuggets, which have a protein level of 10.3%.

This is in line with a study by Rizka et al. that looked at the prevention of anemia in toddlers by consuming chicken and haliling nuggets. They claimed that the P3 treatment had the highest protein level in the chicken and haliling nuggets. There were 11.27g of protein in 100g of nuggets. The P3 therapy was made up of 30% haliling and 70% chicken. This is because the nuggets' protein content rises as the amount of haliling increases.[14] Processing locally sourced foods such as catfish and avocado seed flour increases their nutritional value, particularly in terms of protein quality. The combination of animal and plant protein sources improves protein quality because the amino acids in the ingredients complement each other.[15] Furthermore, catfish contains essential amino acids, lysine and leucine, needed for growth, which are essential for infants and children.[16]

Six pieces of chicken nuggets can satisfy daily calcium requirements because the AAS analysis of the calcium content in the chicken nuggets version shows a calcium contribution of 45.3 mg. One piece of catfish nuggets can satisfy daily calcium needs because the variety has a calcium contribution of 408 mg. In the meantime, eating two pieces of shrimp nuggets can satisfy daily calcium requirements because the shrimp nuggets variety contributes 227 mg of calcium.[17] Calcium is the most abundant mineral and plays a vital role in bone and tooth formation, regulating muscle contractions such as heart rate, and aiding in blood clotting.[18] The calcium content in nuggets is very safe to consume, meeting the Recommended Daily Intake (RDA, 2019), which requires more than 100 mg per day.[19]

This is consistent with a study by Widyawatiningrum et al. that looked at how deep-frying could increase the quality of moringa chicken nuggets. These carrot-enhanced moringa chicken nuggets' protein content satisfied SNI 01-6683-2002's minimum protein content criterion of 9% by wet weight. The protein content of these moringa chicken nuggets was 14.256%.[20]

CONCLUSION AND RECOMMENDATIONS

Based on the results of nutritional content testing at the Medan Research and Standardization Center, the protein content of avocado seed flour nuggets for chicken variants is 11.1%, catfish variants are 9.57%, and shrimp variants are 10.3%. Meanwhile, the calcium content of avocado seed flour nuggets for chicken variants is 45.3mg/kg, catfish variants are 408mg/kg, and shrimp variants are 227mg/kg. With the amount of protein and calcium content of avocado seed flour nuggets, it can meet 20% of the protein and calcium needs of toddlers. From the research conducted, it can be suggested to the community to make these avocado seed flour nuggets as an alternative snack food for toddlers and the use of local foods that are not yet known.

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