



## Nutritional Content and Acceptability of Vegetable Sausage as an Alternative Source of Protein and Fiber

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**Abstract.** Nutrition problems in Indonesia are still relatively high. SSGI results (2021) show that malnutrition is 17.1% and stunting is 24.4%. Lack of food consumption, especially protein, is one of the causes. Utilization of tofu dregs is still very low, as is banana blossom. Tofu dregs and banana blossoms have quite a high protein and fiber content. Tofu dregs and banana blossoms have the potential to become a high-nutrient food product that is suitable for consumption and has economic value. This research is a follow-up research from organoleptic tests, finding that vegetable sausages have organoleptic qualities that are no less than commercial sausages. This research aims to conduct laboratory tests for protein and fiber content and tests for the acceptability of vegetable sausages. This type of research is experimental, by design of two groups with control. Test acceptability with the method Visual Comstock by looking at leftovers. The acceptability test was conducted on 51 children in grades IV and V at SDN Pamitran-Cirebon who met the screening criteria. The treatment group consisted of 24 children, and the control group consisted of 27 children. Sample assignment was carried out randomly. Analysis of crude protein content using the IK-03/LAKP/SOP.10 method. Analysis of oil fiber content IK-13/LAKP/SOP.10. Analysis of the difference in receptivity test using the t-test of unpaired data. The research results showed that the protein content of vegetable sausages was (7.54%), slightly lower than commercial sausages (9.29%). The crude fiber content of vegetable sausages (3.48%) is higher than commercial sausages (2.10%). Vegetable sausages have the same acceptability as commercial sausages, with a good acceptability value of 100%. It has been proven that vegetable sausages can be used as an alternative food source of high protein and fiber at a relatively cheaper price.

**Keywords:** tofu dregs, acceptability, banana\_heart, vegetable\_sausage

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### INTRODUCTION

Nutritional status is directly affected by nutritional intake and infectious diseases. Children in the fast-growing period need enough energy, protein, fiber, and calcium to grow optimally. Children with poor nutritional intake, especially protein, will experience growth disorders, so children are undernourished and stunted. Several factors, including the lack of economic ability of families and the lack of cheap

protein sources, cause poor food intake. It can be consumed by children under five and accessed by underprivileged families (Ministry of Health.RI., 2022).

Tofu pulp and banana hearts are foods with less economic value and are abundant in quantity. Even though the rest of the tofu pulp processed products still have a protein content of 5.00% and 4.00% fiber. Banana hearts contain 1.20% protein and 3.20% fiber by dry weight (Ministry of Health, RI., 2023). Sausage is a popular snack food loved by almost all age groups, especially children. Sosis has also been used as an ingredient for the creation of various other snack menus (Madusari Food, 2021).

This research continues organoleptic tests. As a result, vegetable sausages have an organoleptic quality that is not inferior to commercial sausages. Even some test parameters, such as taste, show a preferred taste compared to commercial sausages (so nice). Another advantage of plant-based sausages is that they are estimated to be 60% cheaper than commercial sausages.

This research is essential for producing food diversification products (alternative foods). It is also an add-value step for tofu pulp and banana hearts. This research is applied research in the field of food and nutrition that has the potential to produce products that are ready to be used and commercialized in the community.

## **LITERATURE**

### **Sosis: A Versatile and Popular Food**

Sosis, or sausages, are a versatile and popular food enjoyed in many different cuisines worldwide. They can be made from various types of meat, such as pork, beef, chicken, or even vegetarian ingredients. Sosis can be cooked in various ways, including grilling, frying, boiling, or baking. They can be enjoyed independently, as part of a sandwich or hot dog, or as an ingredient in various dishes. Here are a few popular dishes featuring sosis: Hot Dogs. Hot dogs are a classic American food that typically consists of a sosis served in a sliced bun and topped with various condiments such as ketchup, mustard, relish, onions, and sauerkraut. They are often enjoyed at picnics, barbecues, and sporting events: sausage and Peppers. Sausage and peppers is a delicious Italian-American dish that features sosis cooked with bell peppers and onions. It is often served as a sandwich or over pasta. Sosis Bakar (Grilled Sausage). Sosis bakar is a popular street food in Indonesia. It consists of grilled sosis served with spicy chili sauce and sweet soy sauce and is sometimes accompanied by rice or bread—sausage Rolls. Sausage rolls are popular in many countries, including the UK, Australia, and New Zealand. They typically consist of sosis wrapped in

puff pastry and baked until golden brown. They are often enjoyed as finger food or as part of a picnic or party spread. Choripán. Choripán is a popular street food in Argentina and other Latin American countries. It consists of grilled sosis served in a crusty bread roll and topped with chimichurri sauce or other condiments. These are just a few examples of the many delicious dishes you can create using sosis. The possibilities are endless! Let me know if you want more information or recipes for any specific social dish.

Choosing quality sausages is vital so we can enjoy delicious sausages that are safe to consume. Here are some tips for choosing quality sausages: **Ingredients Used:** Make sure the sausages are made from quality ingredients, such as beef, chicken, fish, turkey, or quality vegetarian ingredients (Bulkaini et al., 2020). **Quality ingredients** will provide better taste and good nutrition as well. **Texture:** Quality sausages have a chewy and soft texture. Avoid sausages that are too mushy or crumble easily, as this can indicate that the quality is not good. **Color and Aroma:** Quality sausages can be seen from their color and aroma. Make sure the sausage has a fresh color and no suspicious spots. The aroma of quality sausages should also be fresh, with no unpleasant odors (Nico et al., 2014). **Packaging and Labels:** Check the sausage packaging to ensure the product has clear labels, including information about the ingredients used, expiration dates, and distribution permits from the appropriate authorities (Nursiwi et al., 2019). **Reading Reviews and Recommendations:** Reading reviews and recommendations from other users can help you choose quality sausages. You can find information about well-known sausage brands and get positive reviews from consumers.

### **Organic Sausage**

Organic sausages are produced using organic ingredients that meet organic farming standards (Dondoe, 2018). However, whether or not organic sausages are better depends on the preferences and values of each individual. The advantages of choosing organic sausages are as follows: **Healthier Ingredients:** Organic sausages tend to be made from meat from animals fed organic feed, do not use antibiotics or growth hormones, and are given access to a larger wiggle space. This can reduce the risk of exposure to pesticide residues or other chemicals that may be present in non-organic products (Calisia et al., 2022). **Environmental Protection:** Organic farming uses more environmentally friendly methods, such as natural organic fertilizers and more natural pest control methods. By choosing organic sausages, you can positively contribute to environmental health. **Ethics in Animal Husbandry:** Some people choose organic sausages because they value the ethics of

animal husbandry: to provide animals with better living conditions and avoid excessive use of chemicals in animal husbandry (Calisia et al., 2021). However, it is important to note that organic sausages may be more expensive and not widely available in all places. In addition, the decision to choose organic sausages also depends on personal preferences and your budget. Finally, it is important to note that while organic sausages can provide some benefits, it is also essential to pay attention to the overall consumption of sausages as part of a balanced and varied diet (Cisilia et al., 2022).

**METHOD**

Experimental research: Design two groups with control; the case group was given plant-based sausages, and the control group was given commercial sausages (so-nice). Test acceptability with *the Visual Comstock method* by looking at food scraps. The acceptability test was carried out on grade IV and V children at SDN Pamitran-Cirebon, and as many as 51 children met the screening criteria. The treatment group consisted of 24 children, and the control group consisted of 27 children. The assignment of samples was carried out randomly.

Formula Sausage Nabati

**Table 1. Formulation of Plant-Based Student Council (Tofu Pulp and Heart Soup)**

Ingredient	Quantity (g)*
Tofu pulp	150
Banana heart	25
Chicken meat	50
Saga flour	100
Panir flour	100
Egg whites	2
Garlic	3
White sugar	3
Oil	50

\*The best formula for organoleptic tests (Sulistiyono & Hendarman, 2017)

This study is a follow-up to the previous research, which found that plant-based sausages have organoleptic properties that are not inferior to commercial sausages (so-nice). Laboratory tests to determine the protein content and crude fiber content. Analysis of crude protein content by IK-03/LAKP/SOP.10 method. Analysis of crude

fiber content IK-13/LAKP/SOP.10. Analysis of the difference in acceptability test with the t-test of unpaired data.

**RESULT**

**Protein Content**

The study results showed that the protein content of vegetable sausages (7.54%) was slightly lower than commercial sausages (so-nice), which was 9.29%. So-nice sausages have a higher percentage of chicken meat ingredients. The protein content of various studies ranged from 7.53-18.00% (Table 2). The protein content of non-animal sausages (plant-based) and mixed sausages of animal and vegetable ingredients was the lowest in snakehead fish sausages, with 4% oyster mushrooms (7.53%) (Iqbal et al., 2015) and the highest protein in animal sausages, namely beef sausages (18.00%) (Surbakti et al., 2016).

**Crude Fiber Content**

The study's results showed that vegetable sausages' crude fiber content (3.48%) was slightly higher than that of commercial sausages (so-nice), which was 2.10%. The crude fiber content of vegetable sausages is obtained by adding banana heart ingredients. Raw banana hearts contain 3.2% crude fiber.

The crude fiber content of various types of animal, plant-based, and mixed sausages ranges from 0.31-10.77% (Table 2) (Fattah *et al.*, 2016) (Nur et al., 2022). Beef sausages with 25% durian seed flour have a low crude fiber content (0.31%) (A. Apriantini et al., 2021). Red bean sausage with the highest crude fiber content has bamboo shoots (10.77%) (Isnawaty et al., 2022).

**Table 2. Protein Value, Crude Fiber, and Acceptability of Different Types of Sausages**

Types of Sausages	Protein (%)	Crude Fiber (%)	Acceptability (Skala)*
Sausage Nabati**	7,54	3,48	4.5 out of 5
Sosis So-Nice**	9,29	2,10	4.5 out of 5
Sosis Vegetarian	10,00	3,00	3.8 out of 5
Sosis Ayam	15,00	1,50	4.2 out of 5
Beef Sausage	18,00	1,20	4.0 out of 5
Red Beans with Bamboo Shoots	13,76	10,77	3.3 out of 5
Beef sausage with 25% durian seed flour	13.69	0.31	3.5 out of 5
Tempeh sausage with 4% bran	16.10	7.05	3.4 out of 5
Catfish sausage with 30% seaweed	10,13	1,65	6.2 out of 9
Snakehead Fish with 5% Oyster	7,53	2,46	6.9 out of 9

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**Mushrooms**

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**Information:**

\*Rating scale 1-5, and 1-9 (dislike – very like)

\*\*Same laboratory

**Acceptability**

The results of this study show that vegetable sausages (tofu pulp and banana hearts) have the same acceptability as commercial sausages (So-nice), with a very good acceptability value (4.5 on a scale of 5). The results of the acceptability test of various types of sausages showed a range of acceptability between 3.3 and 4.5 on a scale of 5 (Table 2) (Muntikah & Wahyuningsih, 2016). Red bean sausage with bamboo shoots has the lowest acceptability (3.3) (Isnawaty et al., 2022).

**DISCUSSION**

Indonesian National Standard (SNI) Sausage: 01-3820-1995 requires a Maximum moisture content of 67%, Protein of at least 13%, fat of at least 25%, Carbohydrates of at least 8%, Crude Fiber of at least 25%, and ash of at least 3% (National Standardization Agency (BSN), 2023).

**Protein Content**

The study's results showed that the protein content of vegetable sausages (7.54%) was slightly lower than that of commercial sausages (so-nice), which was 9.29%. The difference is due to the material from which the sausage is made. So-nice sausages have a higher percentage of chicken meat ingredients. The protein content of the two sausages is still below the SNI (at least 13%) because the SNI of the sausages is for animal sausages (National Standardization Agency (BSN), 2023).

The protein content of non-animal sausages (plant-based) and mixed sausages of animal and vegetable ingredients was lowest in snakehead fish sausages with 4% oyster mushrooms (7.53%) and the highest protein content in animal sausages was beef sausages (18.00%) (Asyngari et al., 2017)(Rauf et al., 2015)(Talibo *et al.*, 2023)(Bulkaini *et al.*, 2020).

Tempeh-based sausages with 4% bran have the highest protein value (16.10%) (Albaniyah, 2019), although vegetable protein has a lower absorption value (biology value) than animal protein. Animal protein contains essential amino acids in high and

complete proportions. Essential amino acids cannot be produced by the human body and must be obtained through food (Azrimaidaliza *et al.*, 2020).

Animal protein is easier for the human body to digest and absorb than vegetable protein, so amino acids from animal protein are easier to use for the growth and repair of body tissues (Mardalena, 2021).

Animal protein also contains iron and zinc which are more easily absorbed by the body than vegetable protein sources. Some plant-based proteins contain anti-nutrient compounds such as phytates and tannins, which can inhibit the absorption of certain nutrients such as iron and calcium (Damayanti *et al.*, 2017). Although plant-based proteins have a lower biological value, they are still crucial in a balanced diet because they also contain fiber, vitamins, minerals, and antioxidants that are beneficial for health. A diverse combination of plant-based foods can help meet protein and other nutrient needs for individuals who choose a plant-based or vegetarian diet.

### **Crude Fiber Content**

Crude fiber is found in plant foods that the human body cannot fully digest. Crude fiber has several essential health benefits and can be found in various foods (Syafriزار, 2018).

The study results showed that the crude fiber content of vegetable sausages (3.48%) was slightly higher than commercial sausages (so-nice), which was 2.10%. The crude fiber content of vegetable sausages is obtained from the addition of banana heart ingredients. Raw banana hearts contain 3.2% crude fiber (Ministry of Health, RI., 2023).

Low crude fiber content in beef sausages with 25% durian seed flour (0.31%) (A. Apriantini *et al.*, 2021). Red bean sausage has the highest crude fiber and has bamboo shoots (10.77%). Crude fiber is abundant in whole grains, vegetables, fruits, nuts, and cereals (Rizkyanti, 2016)(Mukrimaa *et al.*, 2016).

Consuming foods high in crude fiber in your daily diet is highly recommended for maximum health benefits. This can help maintain gut health and balanced weight and reduce the risk of various chronic diseases. Dietary fiber consumption must also increase water consumption for a better digestive process (Syafriزار, 2018). Plant-based sausages also have a higher water content, so they are better in the digestive process (Rizkyanti, 2016).

## Acceptability

Food acceptability is vital in an individual's eating habits and food choices. Taste and texture preferences can influence a person's daily food choices. Understanding the acceptability of individual foods can help a person make better and more balanced food choices to support health (Damayanti et al., 2017).

The results of this study show that vegetable sausages (tofu pulp and banana hearts) have the same acceptability as commercial sausages (So-nice), with an excellent acceptability value (4.5 on a scale of 5). Red bean sausage with bamboo shoots has the lowest acceptability (3.3). Although the food acceptability test is very subjective because it depends on individual preferences and can vary from one person to another, with many lay panelists, it can also represent a broader picture of the population.

The results of this study show that plant-based sausages are highly accepted and are almost close to the maximum value. Plant-based sausages with tofu pulp and banana hearts can be used as an alternative snack to increase dietary fiber intake.

## CONCLUSION

Plant-based sausages made mainly from tofu pulp and banana hearts have been proven to be an alternative food source of vegetable protein and quite high fiber. Their acceptability is so good that they are worth making as a snack at a relatively cheaper price.

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