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MORALITY BEFORE KNOWLEDGE

Smart cereal: Healthy cereal innovation based on breadfurnish flour and trembesi seed flour as an alternative to prevent diabetes mellitus

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ABSTRACT

Background: Wheat is one of the staple foods in Indonesia. The demand for wheat increases along with the population growth. Unfortunately, the supply of wheat is quite limited. In addition, wheat has a high glycemic index so it is dangerous for consumption by people with diabetes mellitus. Based on this, it is necessary to make efforts to find alternative ingredients to replace wheat. **Methods**: The research method is a literature review. **Finding:** The results of searches from various sources indicate that breadfruit and trembesi seeds can be processed into flour and used as a substitute for wheat. Breadfruit and trembesi seed has a low glycemic index content than wheat flour. Breadfruit flour and trembesi seed flour have the potential to be made into healthy cereals to prevent diabetes mellitus. **Conclusion**: Cereal from breadfruit and trembesi seed flour is healthier than cereal made from wheat flour. **Novelty/Originality of this article:** Until now, there has been no cereal made from the two ingredients we use, namely breadfruit and rain seeds. Both of these ingredients are easy to obtain, have a low glycemic index, and are safe for consumption by people with diabetes mellitus.

KEYWORDS: breadfruit; cereal; trembesi.

1. Introduction

Indonesia is currently experiencing an increase in population, which means that the demand for food is also increasing, especially staple foods. Indonesia's population in 2020-2022 will continue to increase until it reaches 275 million people (BPS, 2022). Wheat is the second staple food in Indonesia after rice, which is generally processed into wheat flour. Wheat consumption in Indonesia is certainly increasing along with the increase in population. Higher food consumption can threaten food security if its availability is insufficient (Kamil & Elwan, 2021). The high level of consumption makes the demand for wheat quite high, on the other hand, wheat is not an indigenous commodity to Indonesia so it cannot thrive in Indonesia. Soil and climatic conditions in Indonesia do not support the optimal growth of wheat, so it relies on imports to meet domestic needs. This dependence on wheat imports risks threatening national food security in the event of price fluctuations and supply disruptions from exporting countries (Tranggono et al., 2023). The solution is to substitute wheat flour with other potential food ingredients.

People need to be made aware that many other foodstuffs can be used as alternatives to wheat. This awareness must be instilled so that when wheat production is insufficient, the community is not worried because there are still many other alternative staples with

higher nutritional potential. Food ingredients that can be utilized as a substitute for wheat flour are breadfruit and Trembesi seeds. Both have the potential to replace wheat flour because they have carbohydrate content that is close to wheat flour. Wheat flour weighing 100 grams contains 76 grams of carbohydrates (USDA Nutrient Database, 2018), while breadfruit flour weighing 100 grams contains 84.4 grams of carbohydrates (Indonesian Ministry of Health, 2017). Meanwhile, Trembesi seed flour weighing 100 grams contains 67.51 grams of carbohydrates (Anjani et al., 2023).

The content of breadfruit flour and Trembesi seeds is not only similar to wheat flour but also has a lower sugar content so it can be a healthy food alternative and can prevent diabetes mellitus. Cases of diabetes mellitus in Indonesia in 2021 reached 279,345 and increased by 64% in 2022 (BPS, 2023). The increase in diabetes mellitus cases even occurs among young people and has become a common concern in recent years. Based on these problems, we offer an innovative solution in the form of SMART CEREAL products.

SMART CEREAL is a healthy cereal made from a combination of breadfruit flour and Trembesi seeds to achieve food security. This is in line with the meaning of food security itself. According to Law of the Republic of Indonesia Number 18 of 2012 concerning Food, Article 1 Paragraph 4 states that food security is a condition of food fulfilment for the state to individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable, and affordable and does not conflict with religion, beliefs, and culture of the community, to be able to live healthy, active, and productive lives sustainably. The SMART CEREAL innovation is expected to reduce the high import of wheat flour as the main ingredient for making cereals so far as well as a prevention effort against diabetes mellitus. This essay aims to explore the potential of breadfruit and Trembesi seeds as alternative staple foods through the manufacture of healthy cereals to maintain food security in Indonesia. The method used in this study is a literature study. We look for the potential of cereal materials from various sources such as journals, books, official government data, and the internet that can be accounted for their accuracy.

2. Results and Discussion

2.1 Ingredients

Wheat flour is the result of processed wheat seeds that are ground into flour (Figure 1). Various foods such as noodles, cakes, bread, biscuits and cereals are made with wheat flour as the main ingredient. Wheat flour is chosen as the primary ingredient of processed food because of its high carbohydrate content, so it is filling and can be a substitute for rice. Consumption of wheat flour must begin to be limited because some ingredients can harm health if consumed excessively. According to Aprilia et al. (2021), wheat flour contains gluten, complex carbohydrates that are insoluble in water, and a high glycemic index value of 71. The high glycemic index value in wheat flour can cause an increase in blood sugar, especially in people with diabetes mellitus.

Fig. 1. Wheat flour
(KOMPAS.com)

Dependence on wheat flour can be overcome by substituting wheat flour with other ingredients, namely breadfruit. Breadfruit (*Artocarpus altilis*) is a local plant that is spread in several regions such as Java, Sumatra, Bali, Maluku, and Sulawesi (Figure 2). Breadfruit is generally only processed by steaming or frying. The lack of innovation in the utilization of breadfruit is quite unfortunate, considering the great potential of breadfruit to reduce excessive wheat consumption. Breadfruit can be processed into flour substitutes with high nutritional content and has several advantages when compared to wheat flour. According to Setyaningsih and Mushlishoh (2021), breadfruit flour contains high calcium and phosphorus. The fibre contained in breadfruit flour is also higher than in wheat flour, so it gives a longer satiety effect. According to Fera et al. (2021), breadfruit flour has a higher crude fibre content of 4.79% than wheat flour which is only 2.52%. Fibre in breadfruit can also reduce glucose absorption from daily food consumption, prevent colon cancer, facilitate bowel movements, eliminate carcinogens, and reduce excess cholesterol.

Fig. 2. Breadfruit
(UMSU.ac.id)

Breadfruit flour has a lower fat content and higher protein than wheat flour. This is proven by Basrin's research (2020), which shows that fat content tends to decrease, while protein content increases along with the addition of breadfruit flour in the formulation of wheat flour substitution. Another advantage possessed by breadfruit flour is that it has a low glycemic index, so it is safe for consumption by people with diabetes mellitus. According to Muhlishoh et al. (2021), the glycemic index of breadfruit flour is relatively low, which is 23, making it healthier than wheat flour.

Another plant that can be used for wheat flour substitution is Trembesi (Samanea saman). Trembesi plants are often found around the highway, especially in East Java. Trembesi has many benefits. Its roots can be used as a medicine to prevent the risk of cancer, while its wood can be used as a building material. Trembesi leaves are useful for treating skin diseases, and the leaf extract can suppress the development of mycobacterium tuberculosis and Staphylococcus aureus.

The part of trembesi that can be utilized as a wheat substitute is the seeds. Trembesi seeds usually called mindhik, siter, or godril are often found scattered and underutilized by the surrounding community (Figure 3). This is quite unfortunate because trembesi seeds can be processed into food as healthy flour. Trembesi seeds have a high carbohydrate content and many other nutritional contents. Amanda (2019) said that trembesi seeds contain 42.82% protein, 6.57% water content, 12.50% fat, 11.72% crude fibre, 1.13% calcium, and 1.01% phosphorus. This content has the potential to be a raw material for various processed products.

Fig. 3. Trembesi seed
(tremes.desa.id)

Another advantage of trembesi seeds is that they have the potential to be a natural sweetener that is safe for people with diabetes mellitus. Trembesi seed powder has a sweet taste but with a low glycemic index. Anjani et al. (2023) tested 3 types of natural sweeteners, namely trembesi seed powder, kawista, and kersen. The results showed that trembesi powder had the highest total sugar content and brix index, which were 65.41% and 6.8%. The natural sweetener from trembesi powder then went through the glycemic index test. The results showed that trembesi powder has a low glycemic index of 29.09% despite having the sweetest taste compared to other natural sweeteners.

Cereal is a food made from grains such as wheat, generally eaten as breakfast. Most cereals today are made from wheat flour, which contains gluten and has a high glycemic index. The innovation of "SMART CEREAL" is here to overcome the existing problems. The brand name SMART CEREAL was chosen because it is easy to pronounce, easy to remember, and comes from the Latin names of the two raw materials. The first raw material is trembesi/*Samanea saman*, the second raw material is breadfruit/*Arthocarpus altilis*, and cereal. SMART CEREAL has not been found in the market until now, but this product has the potential to be developed because of its healthier ingredients. See the Figure 4 below.

Fig. 4. SMART CEREAL package

SMART CEREAL can be an alternative food because it can maintain blood sugar levels and is safe for consumption by people with diabetes mellitus. This is because breadfruit flour and trembesi seeds have a low glycemic index. The glycemic index indicates how quickly carbohydrate foods can affect the increase in blood sugar levels in the body. The glycemic index becomes one of the concepts to keep blood glucose levels normal. According to Vega-Lópe et al. (2018), the glycemic index is categorized into 3 levels, namely low (<55), medium (56-69), and high (>70). Food preparations with a low glycemic index can be used to reduce the risk of diabetes mellitus.

3.2 Procedure of making SMART cereal

The making of SMART CEREAL begins with making breadfruit flour and trembesi seed flour. The steps for making breadfruit flour, according to Novrini (2020) are as follows. First,

peel the breadfruit and wash it with running water until it is clean. Second, cutting the breadfruit into small pieces and then washing it again. Third, soaking the breadfruit in salt water for 30 minutes to remove the sap, then wash and drain. Fourth, putting the breadfruit into the oven at 70°C for 24 hours. Fifth, the dried breadfruit was then pulverized using a blender and sieved using an 80 mesh sieve.

The steps for making trembesi seed flour are as follows (Putri, 2020). First, oven the trembesi seeds at 60°C for 6 hours. Second, drying trembesi seeds with a dehydrator machine at 60°C for 6 hours. Thirdh, roasting the trembesi seeds for 30 minutes. Fourth, crushing the trembesi seeds using a machine. Fifth, sifting the trembesi seed powder to get good and refined flour. The steps of making SMART CEREAL can be observed in the chart below (Figure 5). First, mixing margarine, breadfruit flour, and trembesi seed flour. Second, adding water little by little while kneading until smooth. Third, flattening the dough using a flattening machine. Fourth, putting the dough into the oven at 1500C for 15 minutes. Fifth, removing the cooked flakes from the oven and then allow them to cool. Sixth, reducing the size of the flakes, then weighing them up to 1 kg. seventh, adding seasonings such as milk powder and vanilla flavour. Eight, putting into packaging.
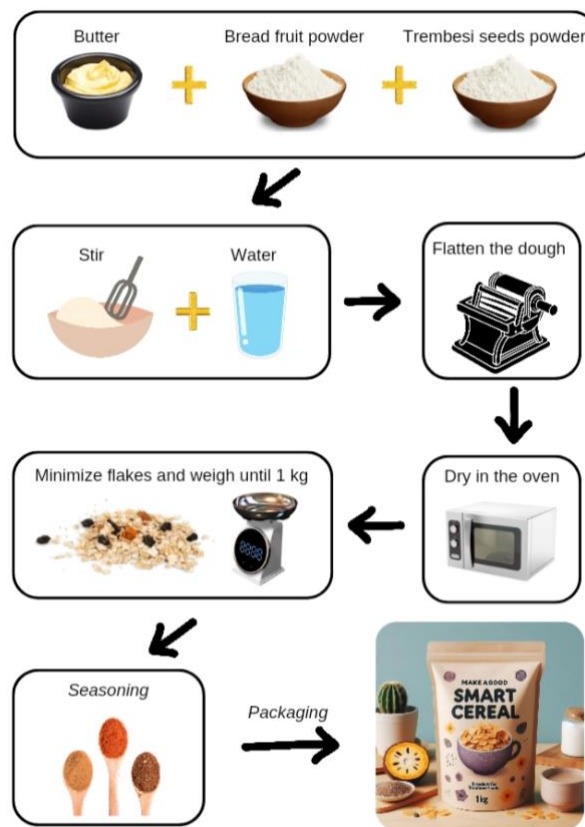

Fig. 5. The procedure of making SMART CEREAL

3.3 SWOT analysis

The SWOT analysis is a tool used to identify a product's strengths, weaknesses, opportunities, and threats. These four elements are crucial for developing strategies to maximize the product's opportunities and strengths while minimizing its threats and weaknesses. The SWOT analysis of SMART CEREAL products is as follows.

Strenghts:	Weakness:
1. SMART CEREAL is made from breadfruit flour and Trembesi seeds, which are healthier than wheat flour-based cereals.	1. The public is still unfamiliar with the taste, texture, color, and aroma of SMART CEREAL.

2. SMART CEREAL has a low glycemic index, making it a healthy food option for people with diabetes mellitus.
3. The main raw materials, breadfruit and Trembesi seeds are abundant in nature.
4. SMART CEREAL is competitively priced as the basic ingredients are abundant in the market.

Opportunities:	Threats:
1. SMART CEREAL has the potential to support efforts to improve food security in Indonesia. 2. Adding value to breadfruit and Trembesi seeds. 3. The high rate of diabetes in Indonesia makes people compete to find healthy food ingredients. 5. This cereal innovation has never been found in similar products.	1. People are used to consuming wheat-based cereals introduced to the market with improved texture, aroma, and taste. 2. Intense price competition from rivals.

3.4 Economic analysis

The market segmentation of SMART CEREAL product is able to reach all levels of society, especially for people with diabetes melitus. This product is offered at a relative affordable selling price. The target market for this product is extensive, covering consumers from various age groups, from children to adults, across all region of Indonesia. The selling power of this product lies in the use of a combination of breadfruit flour and rain seed which have a low glycemic index. This product safe for compsumption by people with diabetes melitus.

SMART CEREAL has passed the business analysis stage. The break-even point (BEP) analysis is one o them. BEP is the point at which a company in its operational activities does not make a profit but also does not experience a loss. This means that the amount of profit obtained is the same as the total of all company costs incurred or is both zero. The purpose of BEP is to determine all production costs, as a basis for calculating profits, estimating the payback period, and analyzing business profitability. Here's the analysis total cost.

$$
\begin{aligned}
Total\ cost &= fix\ cost + variable\ cost \\
&= IDR\ 1,501,000 + IDR\ 1,736,000 \\
&= IDR\ 3,237,000
\end{aligned}
$$

BEP analysis:

$$BEP\ total\ product = \frac{1,501,000}{(35,000 - 17,360)} = \frac{1,501,000}{17.640} = 85\ product$$

$$BEP\ break\ even\ (IDR) = \frac{1,501,000}{(1 - (17,360/35,000))} = \frac{1,501,000}{17.640} = 2,978,175$$

$$
\begin{aligned}
BEP &= \frac{Investment\ value\ x\ Production\ period}{One\ month\ profit} \\
&= \frac{1,501,000\ x\ 1\ month}{26,300\ x\ @100\ product} \\
&= \frac{1,501,000}{263,000} \\
&= 5,7\ months = 5\ month\ 7\ days
\end{aligned}
$$

The relatively short break-even point (BEP) period of 5 months and 7 days indicates that the production of SMART CEREAL offers promising opportunities for empowering the local economy. Now, the realization of SMART CEREAL products requires collaboration with various parties including breadfruit farmers, MSMEs, nutritionists, and the government. First, we need to socialize and invite farmers to plant breadfruit. This is done to ensure the availability of raw materials. Second, we need to collaborate with MSMEs so we can produce products on a larger scale. Third, we need to communicate with nutritionists to find out the nutritional content of products and ensure food safety. Lastly, we need to collaborate with the government to issue P-IRT (Home Industrial Products) certificates and halal certificates.

4. Conclusions

The issue of dependency on wheat flour consumption in Indonesia can be addressed by replacing wheat flour with other potential food ingredients. It can be such as breadfruit and trembesi seeds. Breadfruit and trembesi seeds can be processed into flour, which can then be used to create various food innovations, including cereal.

SMART CEREAL is a nutritious cereal made from breadfruit flour and trembesi seed flour. This cereal is a healthier alternative to wheat flour-based cereals as it is gluten-free and has a low glycemic index, making it safe for individuals with diabetes mellitus. SMART CEREAL is anticipated to reduce people's reliance on a single staple food and raise awareness about the numerous alternative staple foods available besides wheat, thereby contributing to maintaining food security in Indonesia.

Ethical Review Board Statement
Not available.

Informed Consent Statement
Not available.

Data Availability Statement
Not available.

Conflicts of Interest
The authors declare no conflict of interest.

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