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The Potential Of Instant Red Bean Porridge *Phaseolus vulgaris L* For MP-ASI Companion To Baby Growth

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ABSTRACT: Phaseolus vulgaris L. are one of the plant-based food sources rich in nutrients and protein. Red beans contain protein (23.1%), carbohydrates (59.5%), calcium, phosphorus, iron, vitamin A, vitamin B1, and bioactive components such as flavonoids and phytosterols. Instant porridge is a complementary food for breastfeeding infants (known as MP-ASI) that is essential to meet the nutritional needs of babies during their growth phase. Red beans have the potential to be used as a raw material for making instant porridge as a complementary food for breastfeeding. Consuming red beans raw is not advisable, as they still contain several anti-nutritional compounds such as phytic acid, hemagglutinin, antitrypsin, and goitrogens that can hinder the digestion nutritional components. Therefore, a cooking process necessary to eliminate these anti-nutritional compounds, which can include soaking, boiling, and mold fermentation. The research design employed in this study is a literature review with a qualitative descriptive approach, utilizing content analysis methodology that references the analyzed journal manuscripts. Secondary data used in this literature review were obtained from previous research studies. The data sources utilized, namely articles and journals, were obtained from Google Scholar. The results of this literature review reveal the nutritional content present in instant red bean porridge and the potential of instant red bean porridge as a complementary food for breastfeeding. The nutritional content found in instant red bean porridge includes carbohydrates (49.95%), protein (18.79%), fiber (16.54%), and fat (1.20%). Furthermore, instant red bean porridge also contains various antioxidants such as flavonoids, tannins, saponins, triterpenoids, and coumarins.

Keywords: instant porridge, MP-ASI, red beans

INTRODUCTION

Instant porridge is a complementary food for breast milk (MP-ASI) that is urgently needed to meet the nutritional needs that are greatly reduced, so there is a need for a process of giving complementary foods to breast milk (MP-ASI) to babies who enter the age of six months gradually. This is because breastfeeding alone is not enough for nutritional needs. In addition, complementary foods for breast milk or instant porridge also serve as an introduction to the baby's family food. In addition to the practical manufacturing and presentation process, the lifestyle of people today has changed, so to overcome these problems, diversification is needed to create new products without reducing the value of nutritional content or meeting the needs needed by the baby. Instant porridge or MP-ASI is usually sourced from rice flour,

but to reduce rice it can be replaced with nuts that are rich in carbohydrates, protein, fat, and fiber.

The content of nutrients in kidney beans contains a lot of protein and carbohydrates. Another advantage is that kidney beans are cholesterol-free, so they are safe to be consumed by all groups of people from various age groups. Red bean protein can also be used to lower LDL cholesterol levels which are bad for human health, as well as increase HDL cholesterol levels which are good for health. Red beans (*Phaseolus vulgaris L.*) are a type of peanut that is widely cultivated in Indonesia with a total production of 100,316 tons in 2014 (Ministry of Agriculture, 2015). Red beans contain quite high protein and carbohydrates (23.1% and 59.5%) which can be a source of nutrients. Red beans also contain minerals (such as calcium, phosphorus, and iron), vitamins (such as vitamins A and B1), and bioactive components, such as flavonoids and phytosterols (Lanza et al., 2006). However, kidney beans are not good for raw consumption, because they still contain several anti-nutrient compounds such as phytic acid, hemagglutinin, antitrypsin, and goitrogen that can inhibit the digestibility of nutrient components (Agranoff, 2001).

The process that can remove anti-nutrient compounds is soaking, boiling, soaking with acid, and fermentation of mold (Agustina et al., 2019; Audu & Aremu, 2011). Red beans (Phaseolus vulgaris L.) are one of the types of beans that are potential and easy to get in Indonesia. Red bean flour has a high protein content that is not much different from soybeans and mung beans, free of gluten protein (Siddiq, Ravi, Harte, & Dolan, 2010), and can be minimized in anti-nutritional content through the process of soaking (Krupa et al., 2010) and cooking (Shimelis, Meaza, & Rakshit, 2006) so that it has the potential to be developed as baby food. As a country rich in natural resources, Indonesia has the potential for local food from various types of legumes that have the potential to add nutrients in the instant porridge of these beans. Apart from being a source of protein, beans also have other advantages ranging from low prices, have a high fat content for health, and also contain a lot of minerals.

Consumption of foods with diverse nutrients is very important for the growth of babies, especially at the age of 0-24 months. Because breastfeeding alone will not be enough in future growth, because breast milk is enough food to meet the nutritional needs of babies up to 6 months of age only, so there is a need for additional food for the baby that can meet the needs of the baby after the age of 6 months. In principle, supplementary food for babies or can be known as complementary foods for breast milk (MP-ASI) is a food that is rich in nutrients, easy to digest, easy to serve, and affordable. In addition, the benefits of complementary foods for breast milk are many more, including saving preparation time and a variety of additional nutrients. Malnutrition in babies will result in failure of physical growth and development of intelligence and decrease in immunity which results in increased pain and death for toddlers. So that nutrition is one of the indicators of public health, because on a broad scale, nutritional needs have a great influence on growth or development.

The production of MP-ASI at the household level is still sufficient to meet nutritional needs if it is carried out on a nutritious food source that is in accordance with the available food ingredients, both the variety and the amount needed by each child. This can be seen by adjusting the composition of the amount and type of food for breakfast, lunch, and afternoon (Marimbi, 2010). Instant powdered MP-ASI is MP-ASI that has been processed so that it can be served instantly with only the addition of drinking water or other appropriate liquids. The nutrients contained in MP-ASI instant powder must be able to accompany breast milk to achieve nutritional adequacy in this age group. MP-ASI instant powder can be in the form of

powder, flakes, crystals, granules. MP-ASI powder instantly when added liquid produces a fine slurry, free from clumps and can be fed with a spoon (BSN, 2005).

The urgency of this research lies in addressing the nutritional deficiencies prevalent among infants during their critical growth phase. Complementary feeding is essential for infants aged six months and above as breast milk alone is insufficient to meet their dietary requirements. Malnutrition during this period can lead to stunted growth, impaired cognitive development, and weakened immunity, increasing the risk of illness and mortality. Developing instant red bean porridge as a complementary food offers a solution by utilizing a nutrient-rich and locally available ingredient, thereby addressing these critical health concerns while promoting sustainable food diversification in Indonesia.

This study offers novelty by exploring the use of red beans (Phaseolus vulgaris L.) as a key ingredient in developing instant porridge specifically designed for complementary feeding (MP-ASI). Unlike prior research that focused on general food applications of red beans, this study emphasizes their suitability as a nutrient-dense alternative to traditional grains in infant feeding. Additionally, the research incorporates innovative processing techniques to mitigate anti-nutritional compounds, ensuring the porridge is both safe and nutritionally optimal for infant consumption, thereby contributing to advancements in infant nutrition and local food innovation.

The purpose of the study was to determine the nutritional content of instant red bean porridge MP-ASI complementary food in infants and to determine the potential of instant red bean porridge MP-ASI complementary food to infant growth. The benefits of the research are expected to be used as a scientific development that is directly observed by researchers. As a source of information and reference for future researchers and can be used as reference material for readers, and can be applied in a sustainable period.

RESEARCH METHODOLOGY

The research design used in this study is Literature Review or literature review. Literature Review is a description of the material, findings and research materials that will be obtained from reference materials to be used as the basis for research activities. Literature Review can also be said to be an analysis in the form of criticism from researchers that is being carried out on the topic of a science, literature review contains reviews, summaries, and the author's thoughts about several literature sources (articles, journals, books, slides, information, internet, etc.) about the topic being discussed. Good literature must be relevant, up-to-date, and adequate. Theoretical foundations, theoretical reviews, and literature reviews are some of the ways to conduct a literature review.

Table 1 List of Review Literature

Writer	Year	Heading	Result
Syane Palijama, Rachel Breemer, and Miranda Topurmera	(2020)	Chemical and Physical Characteristics of Instant Porridge Based on Corn Flour and Red Bean Flour	The results of the study on the chemical and physical characteristics of instant porridge showed that the content of ash, protein, fat, carbohydrates and rehydration power had a real effect, while the moisture content, fiber and density of kamba had no real effect
Restiara Tamrin and Shanti Pujilestari	(2016)	Characteristics of Instant Baby Porridge Based on Arrowroot Flour and Red Bean Flour	The results showed that the characteristics of instant baby porridge were influenced by different formulations of arrowroot flour and red bean flour, namely on the moisture content, ash, protein, fat, carbohydrates,

			viscosity, water absorption, and kamba density, organoleptic test on the viscosity of instant baby porridge was thawed, and on the color, aroma, and texture of instant baby porridge that was not thawed.
Riyanti Ekafitri and Rhestu Isworo	(2014)	The Utilization of Nuts as a Source of Protein for Emergency Food	In the study, food *bars* were produced in accordance with the emergency food criteria, which contained energy from protein 10-15%, energy from fat 35-45%, and energy from carbohydrates 40-50%.
Novena Yety Lindawati and Sabilla Hudzaifah Ma'ruf	(2020)	Determination of Total Flavonoid Levels of Ethanol Extract of Red Beans (*Phaseolus vulgaris* L.) by Complex Colorimetric Method by Visible Spectophotometry	The results of the research that have been carried out have obtained the results of determining the total flavonoid content in red bean extract of 0.4733% b/b with %KV 1.22%
Rhaesfaty Galih Putri, Priyanto Triwinoto, and Yustinus Marsono	(2020)	Formulation and characteristics of instant red bean porridge (*Phaseolus vulgaris* L.) with sucrose sweetener, isomalto-oligosaccharides and *fibercrème*	The results showed that the substitute of sucrose with IMO and FC sweeteners in the manufacture of instant red bean porridge did not affect the texture, but decreased the acceptance rate. The treatment does not affect the brewing time, but decreases the viscosity of the instant porridge, while *the water holding capacity* increases the amount of fiber and lowers calories.
Tiara Niken Ayuningrum	(2015)	Effect of Preliminary Treatment Differences in Red Bean Flour (*Phaseous vulgaris* L.) as a Wheat Flour Substituent on the Characteristics of White Bread	The results of the research on red bean flour substitute white bread are that there is an effect of preliminary treatment on the color, shape, aroma, taste, and texture characteristics of red bean flour substitute white bread.
R. Baskara Katri Anandito, Siswanti, and Dewi Tri Kusumo	(2016)	Study on the Sensory and Chemical Characteristics of Instant Porridge Based on White Millet Flour (*Panicum Miliceum* L.) and Red Bean Flour (*Phaseolus vulgaris* L.)	The results showed that the millet formula was selected for instant porridge based on the sensory properties of 39.59% white millet flour, 31.25% red bean flour, 17.71% milk powder, 10.41% powdered sugar and 1.04% salt.
Shabrina Itsnaini Oktafira and Budi Setiawan	(2022)	Formulation of ready-to-eat *porridge* based on mung beans (*Vigna radiata*) and black rice (*Oryza sativa* L.) as emergency food	The results of the study showed that the selected formula was F1 with a ratio of green beans and black rice, which was 60:40 which obtained an analysis of energy nutritional content of 535 kcal, protein 20.6 g, fat 9.2 g, carbohydrate 92.6 g, and dietary fiber 21.8 g. The results of this study met the criteria of the Nutrition Label Reference (ALG) of general consumers and had a high fiber claim. The estimated shelf life of the slurry at room temperature (25º) is 21 days

RESULT AND DISCUSSION

Chemical characteristics of red bean porridge

In instant porridge, red beans contain several chemical components in the form of nutrients or nutrients needed by the body. According to previous research by Putri et al., (2020) on "Formulation and Characteristics of Red Bean Porridge (Phaseolus vulgaris L.) Instant with Sucrose Sweetener, Isomalto-oligosaccharides and Fibercreme" explains the chemical components contained in instant red bean porridge which generally uses sucrose sweeteners consisting of water content, protein, fat, carbohydrates and total fiber (Putri et.al, 2020). The following are the characteristics of the chemical components in instant red bean porridge presented in the form of a table.

Table 2 Chemical components of instant kidney bean porridge

It	Chemical components	Number (%)
1	Moisture content (%w/b)	10,31
2	Kadar protein (%w/b)	18,79
3	Fat content (%w/b)	1,20
4	Carbohydrate content (%w/b)	49,95
5	Kadar abu (%w/b)	3,21
6	Total serat (%w/b)	16,54
7	Colori/100g	318,89

Kidney bean powder used as a raw material for making red bean porridge contains active compounds that function as antioxidants, including flavonoids, tannins, saponins, triterpenoids, and coumarin. Flavonoids have antioxidant activity that functions in capturing free radiance, reducing oxidative strees and decreasing the expression of TNF-α, not only that flavonoids function as antidiabetics by suppressing glucose levels, significantly reducing plasma cholesterol and triglyceride levels and increasing liver glucokinase activity which is possible by increasing the release of insulin from the pancreas (Lindawati et.al, 2020).

Red bean flour also contains antinutritional compounds including phytic acid, tannins, hemoglutinin, trypsin inhibitors (antitrypsin), and goitrogen, ways that can be used to reduce these substances include, being peeled, soaked, and boiled, or it can be a combination of these methods (Ayuningrum, 2015).

The Potential of Red Bean Porridge as a Complementary Food

The age of toddlers is an important age for the growth and development of toddlers. In order to avoid stunting conditions, foods that contain high nutrition and are suitable for the digestion of toddlers are needed. Complementary foods (MP-ASI) kidney beans are good for babies and toddlers because red beans contain protein equivalent to meat, even though the type of protein contained in them is an incomplete type of protein. Nuts contain 8 types of essential amino acids that are known to play a role in strengthening the body's immunity against attacks of various diseases (Anonymous, 2013 in (Devi & Fitriyaningsih, 2022). Here are some research results related to the potential of red beans as complementary foods:

Table 3 Potential of Red Bean Porridge as a Complementary Food

References	Motode	Result	Application
Yustiyani and Setiawan,(2013)	Drum dryer, Dry Mixing	formula The best combination of red bean flour and ganyong starch composite in instant porridge against %ALG for children 7-23 months, can be claimed as a food source of protein and zinc and high in iron.	As an instant slurry composite for weaning food
Tamrin and Pujilestari,(Tamrin & Pujilestari, 2016)	Shelling, Mixing	The characteristics of the best instant baby porridge are in accordance with SNI 01-7111.1-2005 on calories, fat, protein and calcium.	Instant baby porridge
Palijama et al. (2020)	Pratanak, Settlement, Mixing	IMO sweeteners have the lowest calories, while FC sweeteners have the highest calories due to the high fat content of fibercreme. The fiber content of IMO sweeteners is higher than that of Sucrose Sweeteners because of the IMO components contained in them.	Instant red bean porridge with various Sucrose Sweeteners, Isomalto-oligosaccharides(IMO) and Fibercreme(FC)

Sources: 1. Yustiyani and Setiawan, (2013), 2. Tamrin and Pujilestari, (Tamrin & Pujilestari, 2016), 3. Palijama et al., (2020)

Based on the research results of some of the researchers above, it shows that the addition of red beans (Phaseolus vulgaris L.) Instant porridge has the potential to be used as a complementary food to breast milk (MP-ASI). This instant porridge formulation can provide a good source of protein and has characteristics that suit the needs of toddlers.

According to Yustiyani and Setiawan, (2014) The contribution of the best treatment of F2 (red bean flour 45%, ganyong starch 15%) as an instant porridge composite to ALG for children aged 7-23 is recognized as meeting BPOM standards as a food source of protein, mineral source and high in minerals. This is because the best treatment contributed 22.25% protein, 27.63% zinc and 55.25% iron ALG for children aged 7-23 months. Foods that can meet 20-35% of ALG protein for certain age categories are categorized as protein source foods. Meanwhile, foods with a certain mineral content of more than 15% are claimed as mineral sources and more than 30% are claimed to be foods high in minerals (BPOM 2011).

Another study that states that red beans have the potential to be a substitute food for breast milk is Tamrin and Pujilestari, (Tamrin & Pujilestari, 2016) this study combines red bean flour and arrowroot flour. The results of this study state that the best treatment of the combination of arrowroot flour and red bean flour with a ratio of 70:30 was in accordance with SNI 01-7111.1-2005 on the parameters of calories, fat 6.62%, protein 16.38% and calcium

360.49 mg/100g. The kamba density and rehydration time of instant baby porridge are better in value than commercial instant baby porridge. The standard for each 100 g of MP-ASI instant powder according to SNI 01-7111.1-2005 states that the standard content of calcium is required to range from 200 to 400 mg/100g, fat is 6 to 15 g, protein is required to range from 8 to 22 g per 100 g.

CONCLUSION

Based on the results of the literature review above, the following conclusions can be drawn, namely; The nutritional content contained in instant red bean porridge includes carbohydrates (49.95%), protein (18.79%), fiber (16.54%), and fat (1.20%). In addition, instant kidney bean porridge also contains several antioxidant compounds such as flavonoids, tannins, saponins, triterpenoids, and coumarins. Instant kidney bean porridge has the potential as a complementary food to breast milk because of its high content of protein, carbohydrates and fiber.

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