Acceptance and Content of Macro Nutritional Instant Baby Porridge Red Rice Flour and Soy Beans With Substitute of Moringa Leaf Flour

Zakaria[1*], Hikmawati Mas'ud[2], Sunarto[3] , Nursalim[4], Nur Fajri Amalia[5]
[1,2,3,4] Nutrition Lecturer of Health Polytechnic of Makassar
[5]Applied Nutrition and Dietetics Study Program Health Polytechnicof Makassar
*Email : zakaria@poltekkes-mks.ac.id

ABSTRACT

Complementary foods are needed for baby after six month because breast milk no longer sufficient for his nutritional needs. The purpose of this research was to determine the acceptability and macronutrient content of instant porridge with brown rice flour with the addition of soy flour and substitution of Moringa leaf flour as complementary foods. This research was a pre-experimental research with a one shot group design approach. Moringa leaf flour substitution formulas were 0%, 5%, 8% and 11%, respectively. Acceptance is tested organoleptically with the hedonic test method (preferred) by moderately trained panelists. The results of the acceptance test of the best instant porridge were calculated for the macronutrient content using the Indonesian Food Composition Table. The results of the study were analyzed descriptively qualitatively percentage. The acceptability of instant porridge on aspects of color, aroma, texture can be accepted in the substitution formula of Moringa leaf flour up to 8%, which is 60-88% of panelists like it. but the level of acceptance in the taste aspect is still low, the highest is in the addition of 5% Moringa leaf flour, namely (52% panelists). Instant porridge in 100 g contains 425.4 kcal energy, protein 20.5 g, fat 12.5, and carbohydrates 62.1 g. It was concluded that instant porridge was acceptable in the 8% Moringa leaf flour substitution formula based on the color, aroma and texture aspects, but was still low on the taste aspect. Instant porridge has met the requirements for macronutrient content as MP-ASI in 100 g of instant porridge.

Keywords : *Instant porridge, Moringa leaf flour,Soy beans*

INTRODUCTION

Complementary foods (MP-ASI) are food or drink introduced by infants from the age of 6 months that are useful for fulfill their nutritional needs. MP-ASI is a transitional food from breast milk even though breast milk is still given until the age of 24 months. Complementary foods introduced gradually to infants in both form and quantity according to the baby's ability. Giving good complementary feeding will help the baby's development and growth well and will be important for the development of intelligence and physical growth in this period (Mufida et al., 2015).

The results of Basic Health Research 2018, show that stunting under-fives decreased by 6% from 2007 – 2018, 36.8% in 2007 to 30.8% in 2018 (Kemenkes RI, 2018). However, this decrease is still far from the target that has been set, namely a decrease of 40%. This shows that the intake of nutrients in infants and children is still low. Various efforts have been made by the government in terms of providing complementary foods, both local complementary foods and ready-to-eat complementary foods, but food diversification is still needed in an effort to meet the nutritional adequacy of infants. Instant baby porridge is one of the ready-to-eat products that is used as complementary foods. The making of instant baby porridge with brown rice flour and soybean flour substituted with Moringa leaf flour is expected to prevent nutritional problems in children under five.

Instant baby porridge is porridge that has instant baby porridge ingredients, so there is no need for a cooking process when served. In Indonesia, the manufacture of instant baby porridge mostly uses basic ingredients, namely brown rice and white rice even though there are other types of food that can be used such as flour

and tubers, the nutritional content is also more than rice only (Krisnatuti & Yenrina, 2000).

The advantages of instant baby porridge are its long shelf life and very practical presentation, most importantly the nutritional content contained in instant baby porridge is quite high. Instant porridge made from brown rice flour and soybean flour with the substitution of Moringa leaf flour is expected to increase the macro nutritional value so that it can become one of the uses of local food and the economic value of brown rice, soybeans and Moringa leaves.

Brown rice is a type of rice produced from rice that has been harvested and then dried so that the water content reaches a minimum of 14% and is processed to break the husk. Substances contained in the husk of brown rice are known to be good for the development of the baby's brain, even the high mineral content can support the growth of teeth, bones, baby muscles and hair. Brown rice also has a high fiber content which is good for the baby's digestion and contains iron to meet the needs of iron intake in the baby's growth (Husain et al., 2020).

Although brown rice does not yet have accurate productivity statistics, its high availability has made some Indonesians accustomed to consuming brown rice. Usually processed as rice, flour or porridge. Apart from being the main source of calories, brown rice also contains thiamin (vitamin B1) which can prevent beriberi and is high in iron so that brown rice can be used as a basic ingredient for making instant baby porridge (Ardhianditto et al., 2013).

According to Almatsier et al., (2011) protein in grains only is not sufficient to meet nutritional needs. Nuts are plant foods that have high protein content. Therefore, in order to be highly nutritious, other ingredients that contain lots of protein are needed, such as nuts. Soybeans are one type of legume that has a high protein content.

Soybeans even become five foods that contain high protein. Soybeans contain 9% water, 40% protein, 18% fat, 3.5% fiber, 7% sugar and around 18% other substances. It can be said that if someone avoids consuming meat, which is known to be a source of protein, it can be replaced by consuming soybeans, for example, if someone needs 55 grams of protein per day, it can be replaced with 157.14 grams of soybeans (Rani et al., 2013).

Moringa leaf is one of the plants found that has extraordinary benefits because it was scientifically found to be an efficacious drug, which has more nutritional content than other plants in general (Krisnadi AD, 2015). Moringa leaves are high in protein in the form of amino acids in the form of isoleucine, glutamic acid, lysine, aspartic acid, alanine, histidine, valine, leucine, methionine, arginine, tryptophan, and phenylalanine. The iron contained in Moringa leaves also has a greater content of 17.2 mg/100 grams compared to other vegetables (Yameogo, et al., 2011). Because of the benefits and nutritional content of Moringa leaves, the Moringa leaf plant is nicknamed *Miracle Tree* and *Mother's Best Friend*. Based on the above background, The purpose of this study was to determine the acceptability of the panelists and the macronutrient content of instant porridge with the substitution of Moringa leaf flour as complementary feeding for infants.

RESEARCH METHODS

The type of this research was pre-experimental with a *one shot group design*. The materials used in this study were brown rice flour, soybean flour, moringa leaf flour, full cream milk flour, refined sugar, eggs, vegetable

oil and baking powder. Moringa leaf flour substitutions for brown rice were 5, 8 and 11% of the total weight of the ingredients. The formulations of the ingredients are presented in Table 1. The equipment used in the study were drying cabinets, flouring equipment, ordinary and digital scales, containers, namely basins, spoons, plates, mixing bowls, stoves, ovens, cooking utensils, stainless steel pans, spatula, net basket, serving spoon, rolling pin, gloves, mask, label, aluminum foil and 80 mesh sieve to produce fine flour. This research was conducted at the Food Technology Laboratory, Department of Nutrition, Poltekkes Makassar.

The process of making instant porridge, namely the ingredients that have been prepared, are weighed according to the formulation and mixed while stirring until a smooth dough is formed. Spread the dough on top of the aluminum foil until it is evenly thin. Put in the oven for about 30 minutes at 180°C. Once cooked cut into small pieces like dice for further drying for 5-6 hours at 60^{o}C, to get a fine powder grind it in a dry blender , to get an even and smooth powder, sieved using a sieve of at least 80 mush size. Instant powder is ready to be brewed 1:1.5 (g/ml) with warm water and ready to be consumed as MP-ASI porridge for babies aged 6-11 months.

The quality variables observed in instant baby porridge are the panelists' acceptability (color, scent, texture and taste) after being brewed with a description of the frequency, and the macronutrient content of the results of the acceptability test of the selected formula calculated using the Indonesian Food Composition Table (TKPI) (DGM), 2018). Characteristics of quality comparison is SNI number 010711.1-2005 quality requirements of complementary foods Instant powder. (National Standardization Agency (BSN), 2005).

RESULTS

The ingredients used in the manufacture of instant porridge as complementary food for babies were selected according to the requirements of good quality ingredients, namely brown rice, soybeans flour, Moringa leaf which were processed by the researchers themselves based on the results of previous studies. Complementary ingredients such as chicken eggs purchased from the market are still new and have no defects, full cream milk and refined sugar, vegetable oil and *baking powder* purchased from supermarkets that are still good based on the expiration date of their use. The quality parameters measured on instant porridge as MP-ASI for babies are as follows.

1. Acceptance of Instant Porridge Panelists

The results of the organoleptic test by hedonic (preferred) as many as 25 panelists on the color of instant porridge as presented in Table 2 showed that in general the panelists liked instant porridge without substitution of Moringa leaf flour (F0), which is 88% panelists, on instant porridge with Moringa leaf flour substitution was 5% (F1) and 8% (F2), respectively, 88% and 80% of the panelists. But on the color of instant porridge with 11% Moringa leaf flour substitution (F3), more panelists did not like it, namely 78% panelists. The results of the research on the texture aspect of instant porridge made from brown rice flour and soybean flour with Moringa leaf flour substitution, the most preferred by the panelists was instant porridge without Moringa leaf flour substitution (84%), then the 5% Moringa leaf flour substitution, namely as many as 20 panelists (80%). The number of panelists who like instant porridge for texture decreases with the increase in the number

of substitutions of Moringa leaf flour, namely 8% and 11% of Moringa leaf flour substitution, panelists like 19 people (76%) and 17 people (68%). The results ofanalysis *Kruskal Wallis H's* showed p value = 0.331, which means that there was no difference in preference for the texture aspect between the four instant porridge formulas.

Panelists' assessment of the scent of instant porridge appeared to be less in the substitution of Moringa leaf flour compared to instant porridge without substitution of Moringa leaf flour, respectively, at the formulas of 0%, 5%, 8%, and 11%, respectively 84%, 64%, 60% and 44% of panelists who like it. The results of the analysis of *Kruskal Wallis H* ,p value = 0.001 which means that there is a difference in preference for the aroma aspect for each concentration. Based on thetest, the *Mann Whitney* concentration showed a *difference,* namely between Formula 0 and Formula 1 and F3, but between formula 1, formula 2 and 3. It means that there is no difference in the aroma of instant porridge substituted with Moringa leaf flour.

The panelists generally did not like the taste of instant porridge, namely instant porridge formula 0 as much as 52%, formula 2 as much as 68%, formula 3 as much as 80%, although the instant porridge in formula 1 (substitution of 5% Moringa leaf flour) was slightly higher that the panelists like it as much as 52%.

2. Macro Nutrient Content

Based on the results of the acceptability test for instant porridge, the substitution formula for Moringa leaf flour was 5% which obtained the acceptance based on the taste aspect by 52% and based on the color, scent, texture, the average was above 80%, the panelists received the largest compared to other samples. The results of the calculation of the energy content without taking into account the effect of processing on the nutritional content of instant baby porridge with brown rice flour and soybeans with a substitution of Moringa leaf flour with 5% substitution of Moringa leaf flour in 100 grams of instant porridge are 425.42 kcal. This has met the recommended adequacy standard. by the Ministry of Health, namely 400-440 kcal per 100 g of instant porridge for infants 6-12 months (Minister of Health, 2007). Selected instant porridge in 100 g contains 20.5 g of protein, 12.5 g of fat and 62.1 g of total carbohydrates.

DISCUSSION

1. Panelists' acceptance of instant porridge

Based on the results of a descriptive qualitative assessment of the percentage that the aspects of color, texture and scent in the formula without substitution of Moringa leaf flour with a substitution formula of 5% and 8% Moringa leaf showed acceptance by panelists but in instant porridge with a substitution of leaf flour Moringa 11% is still relatively low, which means that the panelists do not like it. This is in line with the research conducted by Asih et al., (2018) on the substitution of Moringa leaf for the MP-ASI formulation which stated that the more substitutions of Moringa leaf, the more dark green the resulting color will be. This is due to the use of more Moringa leaf, the green pigment in Moringa leaf containing chlorophyll causes a darker green color. Similarly, the results of research by Zakaria et al., (2020) that an acceptable result in the development of instant porridge is the addition of Moringa leaf flour about 5% 100 g of the main ingredient.

This is similar to the acceptability of instant porridge on texture in Husai's research

(2020) showed that the addition of more Moringa leaf extract will make the texture coarser but this substitution of Moringa leaf does not produce a significant difference in the texture of the porridge. instant. In line with the research conducted by Letlora et al., (2020) concluded that the substitution of Moringa leaf affects the aroma of Moringa porridge because Moringa leaf contain lipoxidase enzymes. This is because the higher the substitution of Moringa leaf flour, the stronger the aroma created so that the panelists' preference for the product will decrease.

In fact, this taste aspect is a key parameter to the acceptability of instant porridge with Moringa leaf flour substitution. According to Kusharto & Marliyati, (2012) the acceptance interval on the hedonic acceptance test is between 76-100%. The results of this study on the parameters of the taste aspect are still low, which is around 52% of the panelists like it. This shows that the higher the concentration of Moringa leaf flour substitution, the more astringent/bitter the taste is created so that the panelists' preference level is low. Similar to the research of Husain N, et al. (2020) showed that the more substitutions of Moringa leaf extract, the panelists' preference level on the taste aspect will decrease. This is presumably due to the distinctive taste caused by Moringa leaf which contain tannins and oxalates, alkaloids that can cause astringent, slightly bitter taste (Aminah et al., 2015).

2. Macro Nutrient Content

Based on the calculation of the energy content without taking into account the effect of processing on the nutritional content of instant baby porridge (brown rice flour and soybeans substituted with Moringa leaf flour in 100 grams of instant baby porridge, substitution of Moringa leaf flour 5%) contains 425.42 kcal of energy . This energy content has met the requirements of complementary foods according to SNI 01-7111.4-2005, namely at 100 grams it must contain 80 kcal per 100 grams of complementary foods. Additional energy for infants 6-12 months of at least 360 kcal (Mufida et al., 2015).

This protein content has met the requirements of complementary foods according to SNI 01-7111.4-2005 must contain 8-22 grams per 100 grams of MP-ASI. Adequacy of protein in children aged 6-11 months is 15 grams (Sugeng et al., 2019; Minister of Health, 2019). The nutritional content of the instant porridge produced is of course supported by the ingredients used, especially sourced from soybean flour, eggs, and full cream milk which also came from Moringa leaf flour ((DGM), 2018). Protein plays an important role in growth and development, in addition to supporting early childhood sports activities. Protein is a key nutrient for children's physical growth because it is needed for bone and muscle growth. In line with the benefits of protein as a nutrient that plays a role in growth, development, it takes 15% - 20.% protein from the total requirement or output per day (Primasoni, 2017).

The same thing with fat and carbohydrate content has met the requirements as stated in the Minister of Health 28 of 2019 above. Fats and carbohydrates are the main sources of energy. Sufficient energy needs can be met by eating a variety of foods and consuming foods that contain sources of carbohydrates, proteins and fats. Inadequate intake of macronutrient nutrients can cause the energy produced to be less than the required energy causing an energy imbalance so that malnutrition can occur (Juliningrum, 2019).

It can be concluded that with the variety of ingredients used in the manufacture of instant porridge with the substitution of Moringa leaf flour, it can meet the nutritional needs of infants, especially the macronutrient needs needed in the process of growth and development so that malnutrition and stunting can be prevented. The weakness of this research has not been carried out in full design and has not carried out a proximate analysis and analysis of the content of protein quality.

CONCLUSION

1. Acceptance of instant porridge based on aspects of color, aroma, texture can be accepted by panelists up to 8% Moringa leaf flour substitution. But from the aspect of taste the acceptance rate of all formulas is still low.
2. Instant porridge with 5% Moringa leaf flour substitution meets the recommended requirements of 100 g instant powder which contains 425.42 kcal of energy, 20.54 grams of protein, 12.53 grams of fat and 62.14 grams of carbohydrates.
3. Need to find ingredients that can reduce the taste that is less liked by the panelists in the selected formula, without affecting the nutritional content and food safety of the instant porridge.

ACNOWLEDGEMENT

The author would like to thank the Agency for the Development and Empowerment of Health Human Resources through the Makassar Health Polytechnic which has provided financial assistance for the implementation of this research.

REFERENCES

(DGM), D. G.M. (2018). *Table of Indonesian food composition 2017*. Directorate General of Public Health, Kemenkes RI.

Almatsier, S., Soetarjo, S., & Soekarti, M. (2011). *Nutrition is balanced in the life*cycle. Publisher of PT Gramedia Pustaka Utama.

Aminah, S., Ramdhan, T., & Yanis, M. (2015). : Kandungan nut risi and the functional properties of moringa plants (M oringa oleifera). *Urban Agriculture Bulletin*, *5*(30), 35–44.

Ardhianditto, D., Anandito, R.B. K., Parnanto, I. N. H. R., & A, D. R. (2013). Study of the characteristics of instant baby porridge made from yellow millet flour (Panicum Sp) and brown rice flour (Oryza Nivara) with the natural flavor of ambon banana (Musa X Paradisiaca L) as a Companion Food asi (Mp-Asi). *Journal of Food Technoscience Vol 2 No. 2 April 2013*, *1*(1), 41–48.

Asih, W. R., Kuswanto, K. R., & Widanti, Y. A. (2018). The addition of moringa leaf puree (Moringa oleifera) and ambon banana puree to the formula MPASI (Complementary Foods breast milk). *Journal of Food Technology and Industry*, *3*(1), 10–17.

National Standrization Agency (BSN). (2005). *Mother's milk companion food (MP-BREAST MILK)-Part 1: Instant Powder.*

Husain, N., Azis, R., & Engelen, A. (2020). *characteristics of instant baby porridge made from brown rice flour with the addition of moringa leaf extract (Moringa oleifera Lam).* *4*(1), 30–42.

Juliningrum, P. P. (2019). Intake of macronutrients in toddlers. *The Indonesian Journal of Health Science*, *11*(1), 40. https://doi.org/10.32528/ijhs.v11i1.2236

Kemenkes RI. (2018). *National report on basic health research (RISKESDAS) 2018.*

Krisnadi A.D. (2015). *Moringa is super nutritional. Pusat information and development of Indonesian moringa plants*

non-governmental organizations.

Krisnatuti, D., & Yenrina, R. (2000). *Prepare complementary breast milk food.* Jakarta: Puspa Swara.

Kusharto, C.M., & Marliyati, A. (2012). Biscuit formulation with catfish dumbo (Clarias gariepinus) Flour and Soy (Glycine max) protein isolates as a potential food for undernourished young children. *Journal of Food Technology and Industry*, *23*(1), 9–16. https://doi.org/10.6066/5287

Letlora, J. A. S., Sineke, J., & Purba, B. (2020). Moringa leaf powder as a stunting toddler food formula. *GIZIDO*, *12*(2), 105–112.

Minister of Health. (2019). Permenkes RI No. 28 of 2019 on the number of nutritional adequacy recommended for the people of Indonesia. In *The Director General of Regulations Perundan-Invitation kemenhum Ham RI*.

Mufida, L., Widyaningsih, T. D., & Maligan, J.M. (2015). Basic principle of breast milk companion food (MP-BREAST MILK) for Infants 6 - 24 Months: Literature Review. Basic Principles of Complementary Feeding for Infant 6 - 24 Months : A Review. *Journal of Food and Agroindustry*, *3*(4), 1646–1651.

Nilawati Husain, Rosdiani Azis, and A. E. (2020). Characteristics of instant baby porridge made from brown rice flour with the addition of moringa leaf extract (Moringa oleifera Lam). *Journal of Agritech Science (JASc)*, *4*(1), 30–42. https://doi.org/10.30869/jasc.v4i1.558

Primasoni, N. (2017). Benefits of Protein to support sports activities, growth, and early childhood development by: *(Email: Nawan_primasoni@uny. Ac.Id)*Abstract, *148*,148–162.

Rani, H., Zulfahmi, & Widodo, Y. R. (2013). Optimization of the process of making soy powder (Flour). *A. Applied Agricultural Research*, *13*(3), 188–196.

Sugeng, H.M., Tarigan, R., & Sari, N.M. (2019). Gambaran child growth and development in the golden period of age 0-24 months in Posyandu Jatinangor Subdistrict. *Jsk*, *4*(3), 96–101.

Ultriastatri, A. (2016). The growth response and yield of two varieties of soybeans (Glyane max L. Merill) aged gentah on weed weed weed treatment. *Bachelor Theoris*,147–154.

Yameogo, W.C., Bengaly, D.M., Savadogo, A., Nikièma, P. A., Traoré, S. A. (2011). Determination of chemical compostion and nutritional values of Moringa olefeira. In *Pakistan journal of nutrition* (Vol. 10, Issue 3, pp. 264–268). https://doi.org/10.3923/pjn.2011.264.268

Zakaria, Rauf, S., Salim, A., Rahman, N., & Bohari. (2020). Development of instant powder with the addition of Moringa oleifera leaf powder as complementary food for infants 6-12 months old. *Systematic Reviews in Pharmacy*, *11*(7), 61–64. https://doi.org/10.31838/srp.2020.7.10

ATTACHMENT

Table 1. The formulation of the ingredients used in the manufacture of instant porridge as complementary foods

No	Ingredients	Treatment			
		F0 (0%)	**F1 (5%)**	**F2 (8%)**	**F3 (11%)**
1	Moringa leaf flour (g)	0	7,5	12,5	17,5
2	Brown rice flour (g)	68	55,5	50,5	45,5
3	Soy bean flour (g)	15	20	20	20
4	Full cream milk flour (g)	10	10	10	10
5	Powdered sugar (g)	5	5	5	5
6	Egg (g)	50	50	50	50
7	Vegetable oil (g)	1	11	1	1
8	Baking powder (g)	0,5	0,5	0,5	0,5
Total		150	150	150	150

Table 2. Distribution of acceptability of instant porridge made from brown rice flour and soybean flour with moringa leaf flour substitution based on color, texture, aroma, and taste aspects.

Moringa leaf flour addition formula	Like		Do not like		Total	
	n	**%**	**n**	**%**	**n**	**%**
Color aspect						
Formula O (0 %)	22	88	3	12	25	100
Formula 1 (5 %)	22	88	3	12	25	100
Formula 2 (8 %)	20	80	5	20	25	100
Formula 3 (11 %)	8	32	17	68	25	100
Texture aspect						
Formula O (0 %)	21	84	4	16	25	100
Formula 1 (5 %)	20	80	5	20	25	100
Formula 2 (8 %)	19	76	6	24	25	100
Formula 3 (11 %)	17	68	8	32	25	100
Aroma aspect						
Formula O (0 %)	21	84	4	16	25	100
Formula 1 (5 %)	16	64	9	36	25	100
Formula 2 (8 %)	15	60	10	40	25	100
Formula 3 (11 %)	11	44	14	56	25	100
Taste aspect						
Formula O (0 %)	12	48	13	52	25	100
Formula 1 (5 %)	13	52	12	48	25	100
Formula 2 (8 %)	8	32	17	68	25	100
Formula 3 (11 %)	5	20	20	80	25	100

Table 3. Nutritional value of instant porridge made from brown rice flour and soybean flour with moringa leaf flour substitution formula 1 (moringa flour substitution 5%).

Ingredients	Weight (gr)	Energy (kkal)	Protein (g)	Fat (g)	Carbohydrate (g)
Moringa leaf flour	7.5	15.37	2.03	0.17	2.86
Brown rice flour	55.5	199.2	4.16	0.5	43.07
Soy bean flour	20	69.4	7.18	4.12	5.98
Full cream milk flour	10	44	1.65	1.93	4.95
Powered sugar	5	18.2	0	0	4.7
Egg	50	68.3	5.52	4.81	0.31
Vegetable oil	1	9.02	0	1	0
Baking powder	1	1.88	0	0	0.27
Total ingredients	**150**	**425.42**	**20.54**	**12.53**	**62.14**
Weight per serving	30	127.62	6.162	3.76	18.64