



Nutrition of Baby Cookies Made from the Red Rice and Anchovy as a Complementary Foods for Breast Milk

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Abstract. Breast milk is the best and most suitable food for babies because it contains antibodies and all the nutrients needed for a baby's growth. However, as the baby gets older, breast milk alone cannot meet the baby's nutritional needs, so additional food is needed which is called complementary food. This research aims to determine the ratio of the red rice and anchovy flour to produce baby cookies that consumers like and have a nutritional composition that meets Indonesian National Standards (SNI standards). Making cookies was done by mixing all the required ingredients, molding, and baking at 120°C for 30 minutes. Specifically, for the red rice flour and fish meal, the ratio was varied to 100:0; 90:10; 80:20; 70:30; and 60:40. The flavour and aroma test of cookies were carried out using a ranking test by 31 respondents and the data obtained was processed using SPSS. Nutritional value analysis was carried out on cookies with the formula that respondents liked most. The research results showed that cookies with a ratio of red rice and anchovy flour of 90:10 had the flavour and aroma that respondents liked most with nutritional content that met SNI 01-2973-2011 standards.

Keywords: Baby cookies, complementary foods for breast milk, red rice, anchovies, nutrition.

1. Introduction

Complementary breast milk food (MPASI) is food or drink that contains nutrients and is given to babies or children aged 6-24 months to meet nutritional needs other than breast milk [7]. MPASI should be given after the baby is 6 months old. MPASI is needed because after 6 months of age, babies need energy, protein and iron which cannot be obtained by consuming breast milk [10].

The problem faced in preparing additional food or complementary food for breast milk is how to arrange the food so that it meets the nutritional needs of children with good nutritional quality. One type of animal food that has many high nutritional components is anchovies (*Stolephorus sp.*). Anchovies have small and soft bones, making it possible to consume them as a whole. The protein, calcium and phosphorus content of anchovies is quite high, namely each containing around 16% protein; 0.5% calcium; 0.5% phosphorus and essential fatty acids (omega 3, omega 6) in 100 grams of fresh anchovies (Directorate of Nutrition, Ministry of Health, 2002). Protein is a building block that babies need to make new cells, while calcium and phosphorus are needed to build bones, strong teeth, help nerve development and muscle function, while

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omega-3 essential fatty acids are for the development of baby's brain intelligence, improving memory. and baby's grasping power.

Anchovies, like other fish, spoil relatively quickly, so they must be immediately processed into functional food products, one of which is by making anchovy flour which will be fortified into brown rice flour which will be made into baby cookies. Apart from anchovies, brown rice is also a cereal as a source of energy which has many nutritional contents, including red pigment (anthocyanin pigment) which acts as an antioxidant compound that can ward off free radicals. The use of anchovy flour added to brown rice flour which is made in the form of biscuits is expected to be able to meet the complete nutritional needs of babies during their growth and developments. The quality requirements for fish meal that have been set by the Department of Agriculture are stated in the Indonesian National Standard (SNI. 01-2715-2010). Cookies are a form of complementary food for breast milk that is often found in various brands. With that in mind, the functional food products made in this research are provided in the form of cookies. Besides that, the appeal of cookies is that they have a longer shelf life and can be made in various shapes.

Table 1. Fishmeal quality requirements

No.	Chemical composition	Quality
1	Water content (%)	Max 12
2	Crude protein (%)	Min 45
3	Crude fiber (%)	Max 3
4	Ash content (%)	Max 30
5	Lipid (%)	Max 12
6	Ca (%)	2,5-7,0
7	P	1,6-4,7
8	NaCl (%)	Max 4
9	Microbiology: Salmonela (at 25 gr sample)	Negative
10	Organoleptic (%)	Min 6

Source: SNI. 01-2715-2010

1.1 Brown rice

Brown rice is rice that is rich in fiber and natural oils, which prevent various digestive tract diseases and can improve brain development and lower blood cholesterol. Brown rice contains thiamin (vitamin B1) which is needed to prevent beriberi in babies, and iron is also higher. Another nutritional element found in brown rice is selenium which has the potential to prevent cancer and degenerative diseases [4].

Apart from its nutritional content, another advantage that brown rice has is its fiber which is relatively easier to digest in the intestines. This causes food remains not to be retained in the intestines for too long so that the intestines do not have time to absorb the toxins carried in the food. So, the body will be protected from toxins that have the potential to cause cancer. Apart from that, brown rice is also rich in vitamins B and E

so it doesn't easily cause bloating when consumed. This is what differentiates brown rice from other foods which also contain lots of fiber [6].

Table 2. Nutritional composition per 100 grams of white rice and brown rice

Nutritional composition	White rice	Red rice
Energy (kcal)	360	359
Protein (g)	6,8	7,5
Lipid (g)	0,7	0,9
Carbohydrate (g)	78,9	77,6
Calcium (mg)	6	16
Phosphor (mg)	140	163
Ferrum (mg)	0,8	0,3
Vitamin A (SI)	0	0
Vitamin B1 (mg)	0,12	0,21
Vitamin C (mg)	0	0
Water (g)	13	13

Source: Directorate of Nutrition, Ministry of Health (2002)

1.2 Cookies and Quality Conditions for Baby Cookies (MPASI)

Cookies are biscuits made from soft dough, high fat content, relatively crunchy, when broken, the cut section is hollow. MPASI cookies are produced through a baking process that can be consumed after being crushed with the addition of water, milk or other liquids suitable for babies over 6 (six) months or based on medical indications, or can be consumed directly according to the age or digestive organs of the baby/child. The ingredients used must be high quality, clean, safe and suitable for babies and children aged 6 (six) months to 36 months. The processing process must follow the production method for baby and child food.

MPASI cookies are made from one or a mixture of ingredients: cereals (rice, corn, wheat, sorghum, barley, oats, rye, millet, buckwheat), nuts (mung beans, red beans, cowpeas, pigeon peas), grains containing oil (soybeans, peanuts, sesame) and/or other suitable food ingredients [1] [2]. The quality requirements for baby cookies (MPASI) based on SNI 01-2973-2011 can be seen in Table 3.

Table 3. Quality requirements for baby cookies (MPASI) based on SNI 01-2973-2011

Nutrients (Composition)	Rate
Water	Max 5%
Ash	Max 1,5%
Fat	Min 9,5%
Carbohidrat	Min 70%
Proteint	Min 9%

Fiber	Max 5%
Calcium (Ca)	Min 0,2%
Iron (Fe)	Min 0,005%
Calori Cal/100 gram	Min 400

Source: SNI 01-2973-2011

2. Methods

This research was carried out in 2 stages. In the first stage, organoleptic tests were carried out on five cookie formulas varying from a mixture of brown rice flour and anchovy flour which were given the symbols F1–F5. Organoleptic tests were carried out for flavour and aroma using the ranking test. The number of respondents was 31 people. The organoleptic value used consists of five numerical scales, namely 1 (don't like it), 2 (don't like it), 3 (somewhat like it), 4 (like it), and 5 (like it very much). Panelists were asked to provide an assessment of the sample according to the existing hedonic scale. Next, the results of the panelists' assessments were processed using the SPSS application. The selected cookies, namely the cookie formula with the highest score, are then tested in the second stage, namely chemical analysis which includes: analysis of water, protein, fat, ash, fiber and calcium oxide (CaO) content. Chemical analysis was also carried out on control samples, namely cookies that were not given fish meal.

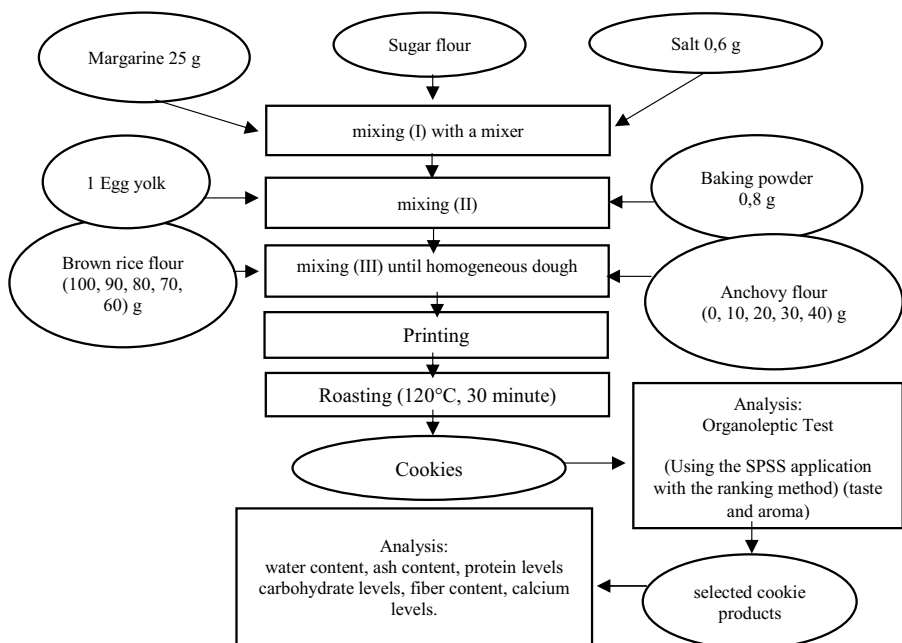


Fig. 1 Scheme for making and analyzing baby cookies

3. Results and Discussion

3.1 Organoleptic test of baby cookies (ranking method)

Organoleptic tests on baby cookies are not only carried out on toddlers but are also carried out on their mothers. According to [11], the acceptance of additional food for young children can be seen based on the mother’s criteria. One of the criteria states that small children’s additional food can be accepted if the mother likes the flavour of the additional food.

a. The aroma of baby cookies

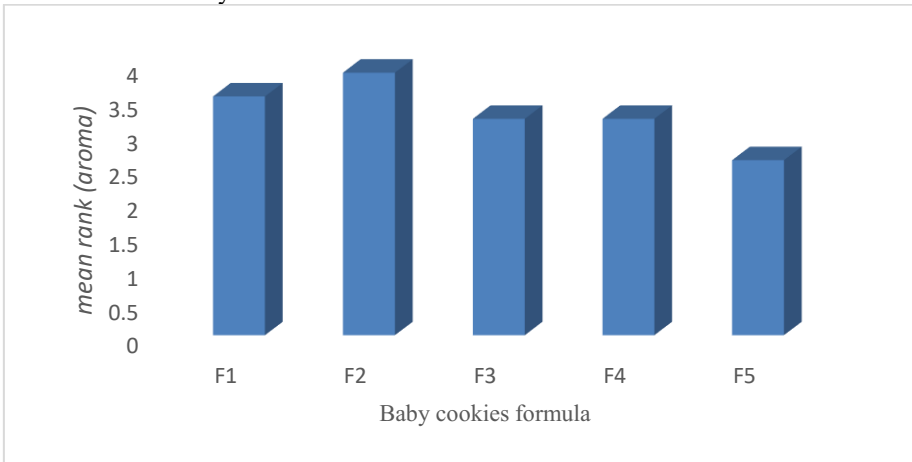


Fig. 2. Relationship between baby cookie formula and aroma mean rank

The organoleptic test results for aroma parameters in Figure 2 show that F2 cookies have the highest score, namely they are highly preferred compared to other formulas. The addition of anchovy flour has an influence on the aroma of the cookies. The increasing level of anchovy flour added produces a very strong fishy aroma that is undesirable.

3.2 The flavour of baby cookies

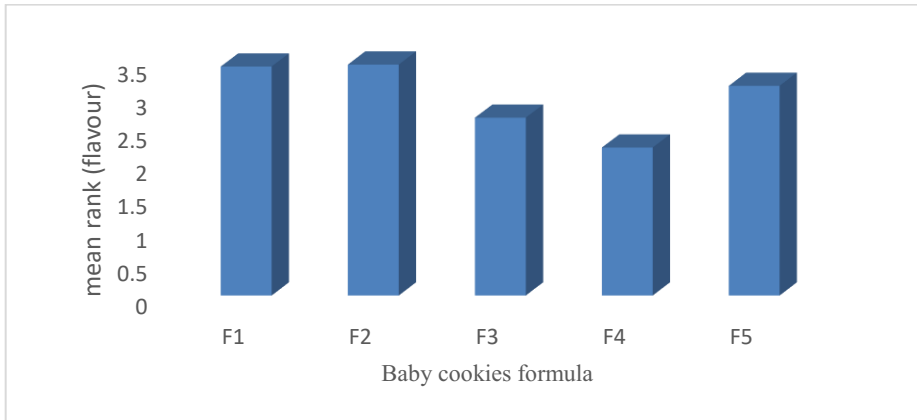


Fig. 3. Relationship between baby cookie formula and mean flavour rank

Figure 3 organoleptic test results for flavour parameters show that F2 baby cookies have the highest score, namely they are highly preferred compared to other formulas. The addition of anchovy flour has an influence on the flavour of the cookies. Increasing levels of anchovy flour addition resulted in a very strong fishy flavour that respondents did not like.

3.3. Chemical analysis of selected baby cookies

The results of the organoleptic test for flavour and aroma parameters showed that F2 baby cookies, which used a 90:10 mixture of brown rice flour and anchovy flour, had the highest score, namely highly preferred, so F2 cookies were chosen as the selected cookies. Determination of the nutritional content of selected cookie samples was carried out through chemical analysis. Apart from that, chemical analysis was also carried out on control cookies, namely cookies that used brown rice flour (100%) without being fortified with anchovy flour. The analysis results are presented in Table 4.

Table 4. Results of chemical analysis of selected baby cookies

Component	Cookies F2	Cookies Control	Standart SNI 01-2973-2011
Water (%)	4,93	5,15	Max 5%
Proteint (%)	12,02	6,75	Min 9%
Fat (%)	15,45	6,72	Min 9,5%
Ash (%)	2,44	1,25	Max 1,5%
Fiber (%)	4.46	4.68	Max 5%
Calcium, CaO (%)	15,38	2,76	Min 0,2%

3.3.1. Water content of baby cookies

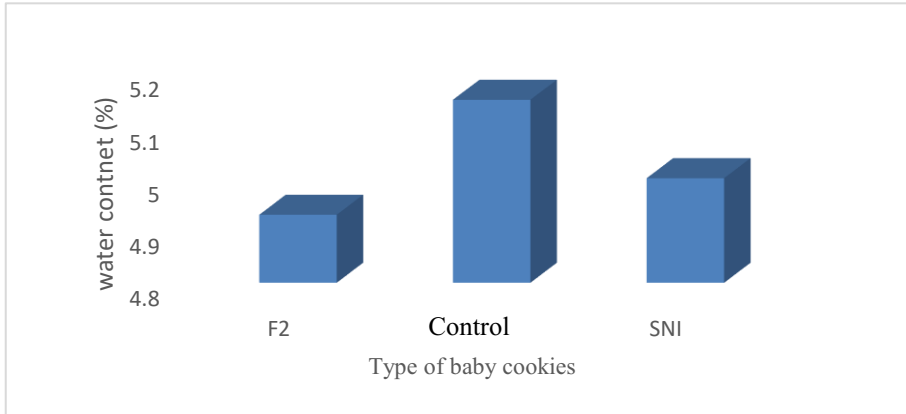


Fig. 4. Water content of selected baby cookies and control against SNI quality requirements

The analysis results in Figure 4 show that the moisture content of the cookies produced was 4.93% for F2 cookies and 5.15% for the control. The quality requirement for baby cookies based on SNI 01-2973-2011 is a maximum of 5%. The moisture content of the cookies produced is lower than the SNI requirements for baby cookies, so it can be said that the moisture content of F2 cookies meets the quality of biscuits based on SNI. 01-2973-2011. Water is an important component in food ingredients which can influence the appearance, texture and flavour of food. The water in food ingredients also determines the freshness and durability of the food. The higher the water content, the less durable the food ingredients will be.

3.3.2. Protein content of cookies

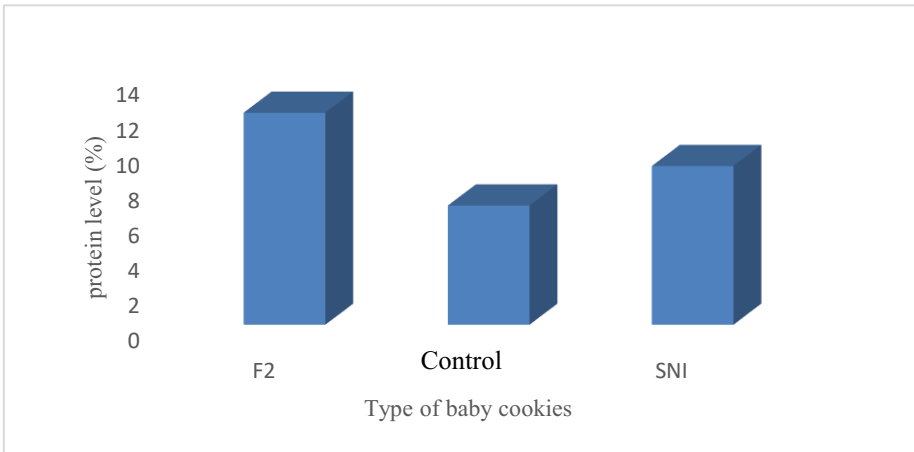


Fig. 5. Protein content of selected baby cookies and control against SNI quality requirements

Based on the analysis results in Figure 5, the protein content in F2 cookies is 12.02%. This result is significantly different from the protein content in control cookies, namely 6.76%. This is due to the addition of 10% anchovy flour to F2 cookies which

contains sufficient protein. high, namely 88.53%, so the addition of anchovy flour has a big influence on the protein content in F2 cookies. According to [3], the nutritional value of anchovies is quite high, especially as a source of protein and minerals, while the fat and vitamin content is low. The high level of protein in anchovies is because almost all parts of the fish's body contain protein.

The use of anchovy flour can be said to be successful in increasing the protein content of cookies and can be used as an alternative high protein food for children. As according to [8], protein is used for the growth and maintenance of body cells. In babies and children, growth occurs gradually and the most important thing that is clearly visible is the growth in body size (weight and height). To meet the protein needs of babies and children, high quality protein should be provided. According to SNI 01-2973-2011, baby cookies require a minimum of 9% protein. From the data obtained, F2 cookies meet the SNI 01-2973-2011 standard.

3.3.3. Fat content of cookies

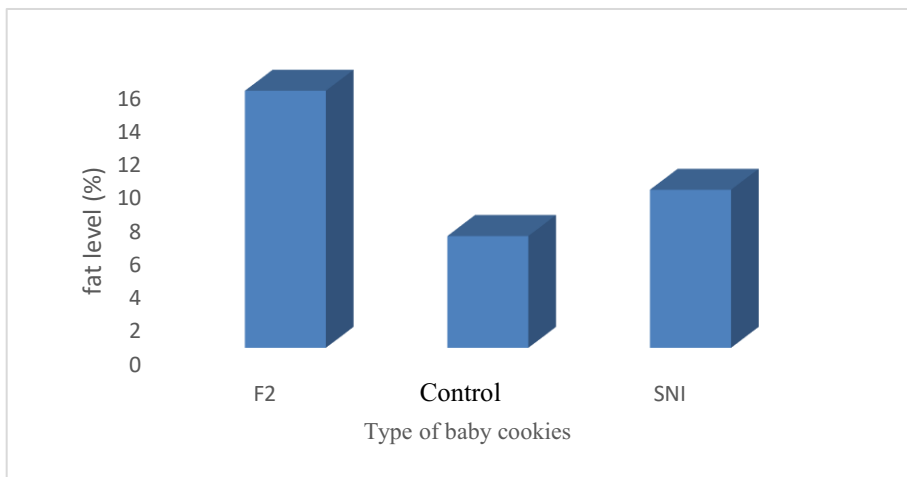


Fig. 6. Fat content of selected cookies and control against SNI quality requirements

The analysis results in Figure 6 show that the fat content in F2 cookies is higher than the control. The high fat content of F2 cookies is due to the addition of high-fat ingredients to the dough, namely margarine and eggs. This is because margarine consists of 80-81% total fat. This is supported by the opinion of [5], margarine contains a number of lipids and some of these lipids are present in bound form as lipoproteins. If margarine is added to the dough, the dough will also have a high fat content [9]. According to SNI 01-2973-2011 requires a minimum fat content in baby cookies of 9.5%. When compared with the minimum fat content requirements in SNI, the product fat content is above the minimum fat content requirements in SNI, so it can be said that based on the fat content, The F2 cookies produced have met quality requirements.

3.3.4. Ash content of cookies

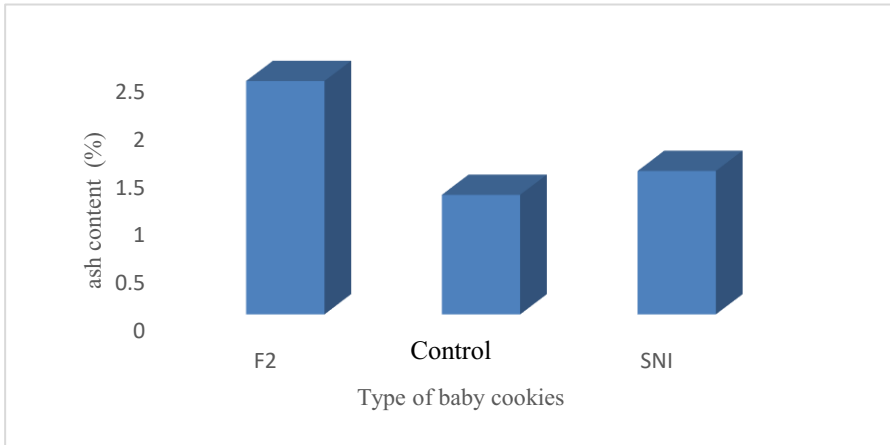


Fig. 7. Ash content of selected cookies and control against SNI quality requirements

The analysis results in Figure 7 show that the ash content in F2 cookies is 2.44% based on SNI 01-2973-2011, the maximum ash content in cookies is 1.5%. The addition of 10% anchovy flour to F2 cookies had a significant effect on the ash content of the cookies. This quite high ash content is caused by the fish raw materials used not only from fish flesh but also from fish bones which contain lots of minerals such as calcium, phosphorus and others. Apart from that, it is due to the use of margarine which has been enriched with mineral content and the use of salt. Therefore, the addition of 10% anchovy flour increases the ash content in cookies. This is in accordance with the opinion [14] that the high ash content in the material indicates a high mineral content. Even though the ash content in F2 cookies exceeds the standards set by SNI, these cookies are still suitable for consumption. This is based on the Protein Advisory Group (PAG) standard, stating that the ash content in additional baby food is a maximum of 5% to maintain baby safety.

3.3.5. Carbohydrate content of cookies

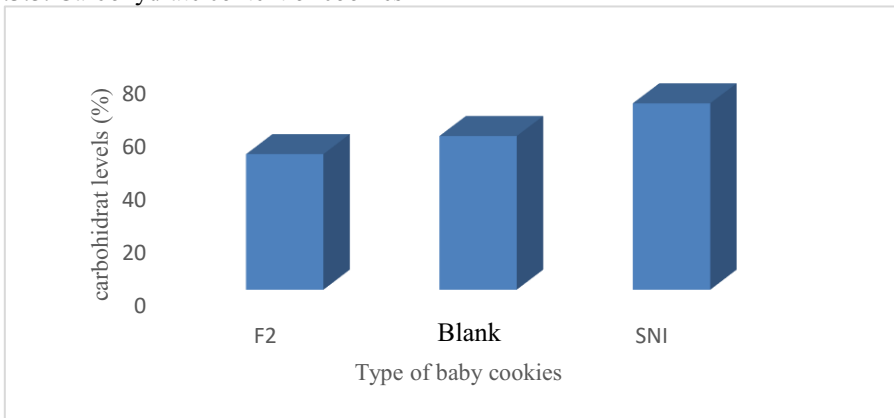


Fig. 8. Carbohydrate content of selected cookies and control against SNI quality requirements

The results of the analysis of carbohydrate levels can be seen in Figure 8, the carbohydrate levels in F2 cookies are lower than in control cookies. This is due to the addition of anchovy flour which contains high nutritional components. As stated by [13], the carbohydrate levels obtained are influenced by nutritional components, the lower the other nutritional components, the higher the carbohydrate levels. Likewise, the higher the other nutritional components, the lower the carbohydrate levels. One of the nutritional components used is the addition of anchovy flour. The carbohydrate content of the two baby cookies has not yet reached the range of quality requirements for SNI 01-2973-2011 baby cooks, namely a minimum of 70%.

3.3.6. Fiber content of cookies

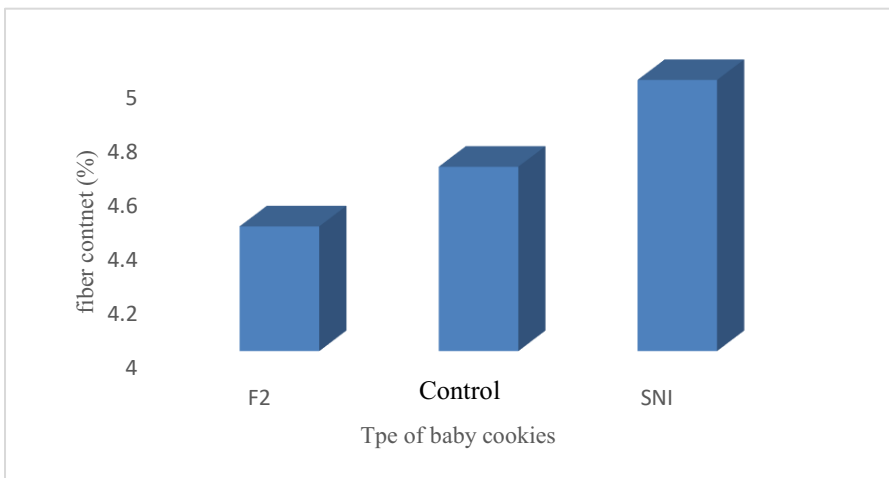


Fig. 9. Fiber content of selected cookies and control against SNI quality requirements

Based on the analysis results in Figure 9, it is known that the fiber content of control

cookies is 4.68%. This result is not significantly different from the fiber content of F2 cookies, namely 4.46%. Based on the fiber content requirements for baby cookies SNI 01-2973-2011, namely a maximum of 5% so that these cookies can be consumed by babies three years old. The crude fiber content in baby food must be low, not more than 5%. If a food product contains high amounts of crude fiber, then the food product is relatively very detrimental because crude fiber has the potential to interfere with the absorption of the nutrients' protein, fat, vitamins and minerals that the body needs. High fiber levels can cause the stomach to become full quickly because fiber has high water absorption capacity so that babies become full more quickly even though nutritional intake has not been met. This is in accordance with the opinion of [14], the main role of food fiber is its ability to bind water, cellulose and pectin. The presence of fiber helps speed up the processing of food waste through digestion to excrete it. Crude fiber aims to assess the quality of ingredients and to evaluate a food processing process.

3.3.7. Calcium oxide (CaO) cookies

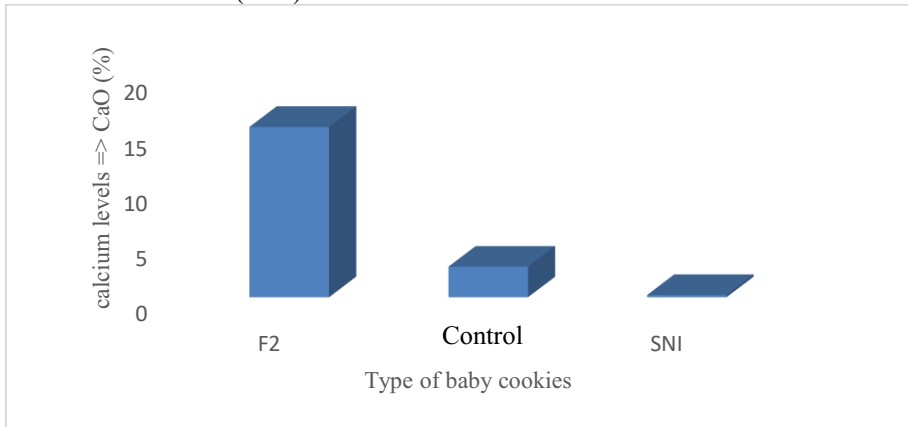


Fig. 10. Calcium content of selected cookies and control against SNI quality requirements

The calcium levels produced in this study can be seen in Figure 10. The highest calcium levels were produced in F2 cookies, namely 15.38% and the lowest in control cookies, namely 2.76%. There was a very significant difference in calcium between F2 cookies and control cookies. The high levels of calcium in F2 cookies were caused by the addition of fish meal so that the more anchovy meal added, the higher the calcium levels. As stated by [15], fish meal used not only from fish flesh but also from fish bones and heads contains many minerals, one of which is calcium.

4. Conclusion

The cookies selected based on the organoleptic flavour and aroma test were formula F2 cookies, namely a ratio of 90:10 brown rice flour and anchovy flour. The nutritional quality of selected cookies (formula F2) meets SNI quality requirements for water, protein, fat, fiber and calcium content. Meanwhile, the ash content of aaa92.44%) exceeds the maximum value required by SNI (max 1.5%), but meets the standards of the Protein Advisory Group (PAG) (2000), stating that the ash content in additional

baby food is a maximum of 5% to maintain baby safety.

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