



Study of Physicochemical and Sensory Properties of Cereal Drink for Pregnant Women Based on Protani Rice Flour

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Abstract. Nutrition is an important factor in the health of pregnant women, because inadequate nutritional intake will affect fetal development. Efforts to overcome the nutritional deficiency of pregnant women are by providing additional food, namely cereal drinks. Cereal drink is a ready-to-eat product consisting of milk and cereal. Egg yolk is a better emulsifier than egg white because it contains lecithin. Lecithin in egg yolk serves as an emulsifier that is useful for forming the texture of the dough. The purpose of this study was to determine the characteristics of cereal drinks with variations of protani rice flour, banana flour, mung bean flour, corn flour and egg yolk percentage and to determine the best combination of treatments. This study used a completely randomized design (CRD) with the factors studied were variations in protani rice flour, banana flour, mung bean flour, corn flour and egg yolk percentage with levels of 0%, 2% and 4%. Variables tested include pH, color (L^* , a^* , b^*), water content, ash content, protein content, fat and carbohydrate content by difference and sensory testing includes aroma, taste, texture and overall. The test results of the variable characteristics of cereal drinks were analyzed using ANOVA and the Duncan Multiple Range Test further test at the level of $\alpha = 5\%$. The best treatment was tested using the effectiveness index method. The results showed that variations in protani rice flour, banana flour, mung bean flour and corn flour had an effect on pH, color (L^* , a^* , b^*), water content, ash content, fat content, protein content, carbohydrates by difference, aroma, taste, texture and overall. The percentage of egg yolk increased the pH value, color (L^* , a^* , b^*), water content, ash content, aroma, taste, texture and overall while the water content, fat content and pH decreased. The interaction between the two factors has no effect on the pH value. The best treatment was obtained with variations of protani rice flour: banana flour: mung bean flour: corn flour by 70: 5: 10: 15 with a percentage of 2% egg yolks having a pH value of 6.83; water content 2.33%; ash content 2.47%; fat content 8.67%; protein content of 9.95%; carbohydrates 78.2%; in accordance with SNI 01-4270-1996.

1 Introduction

During pregnancy, the nutritional needs of the mother must be met properly, because insufficient nutritional intake will affect the child's growth and development and can increase health risks in the child who will be born [1]. A common nutritional problem of pregnant women is the lack of protein energy intake [2]. Feeding that is high in protein can also spur children's height [3]. One of the efforts that can be done is the provision of additional feeding to pregnant women. Supplementary feeding is expected to affect the nutritional status and the baby to be born. Additional foods that will be given are cereal drinks.

Cereal drink is a type of ready-to-eat product that is consumed to replace breakfast consisting of milk and cereals. Cereals are processed products from grains that are consumed as breakfast, but can also be used as an additional food. Generally, cereals are packaged in ready-to-eat form or require cooking before consumption, one of which is in the form of flakes called flakes [4]. Based on [5] flakes belong to the cereal milk food group, which is an instant powder made from powdered milk and cereals with the addition of other foodstuffs and or without permitted food additives.

Generally, most Indonesians consume rice as a staple food. Rice is a food ingredient as a source of energy for humans. In addition, rice is also a source of protein, vitamins and minerals that are beneficial to health [6]. The rice used in this study is protani rice, where this variety has the advantage of a higher protein content than other rice, which is 9.81% [7].

The addition of cornmeal because corn has advantages with its yellow color and a fairly high amylose content, so that it can improve the color and crispness of the flakes. The high fiber content in bananas will affect the texture of the flake, therefore it is necessary to add other ingredients to help improve the crispness of the flake, and by using banana flour will give banana aroma to flakes products [8]. The addition of mung bean flour due to the protein content in every 100 g of green beans by 7 g, as well as the fiber content of 7.6 g [9].

According to [10], egg yolk is a better emulsifier than egg white because the lecithin content in the yolk is found in complex form as lecithin-protein. Lecithin in the yolk serves as an emulsifier that has the ability to bind water and fat.

Based on the above, the manufacture of cereals with several flours including rice flour, banana flour, green bean flour and corn flour is expected to be able to increase the nutritional content of cereals and is expected to be able to meet the nutrition of pregnant women. And with the addition of egg yolks in the manufacture of flakes, it is hoped that it will be able to form a texture so that flakes with the highest quality are obtained.

2 Research Methodology

2.1 Materials

The tools used in this study were maspion brand electric stoves, kirin brand ovens, 80 mesh and 100 mesh sieves, basins, baking sheets, scissors, spoons, spatulas, yokohama brand pans, polyethylene bags, polypropylene bags, and analysis for chemistry.

The ingredients needed in this study are protani rice, organic circumference brand banana flour, organic ring bean flour, mugo brand cornmeal, quintessence brand refined sugar, refina brand salt, mineral water, greenfields brand milk, royal palmia brand margarine, egg yolk, toffieco brand vanilla essence, indomilk brand powder milk, ellenka brand creamer, baking paper, plastic, aluminum foil packaging, and chemicals.

2.2 Experimental Design

This study used an experimental research method with Complete Randomized Design (CRD). The first factor is protani rice flour: banana flour (60:15, 65:10, 70:5 g) and the second factor is the percentage of egg yolk (0%; 2%; 4%).

2.3 Rice Flour Making

The procedure of making rice flour in this study refers to [11]. The first step is to prepare rice. The rice was dried with a cabinet dryer until it was broken dry for ± 6 h at 60 °C. Then grind using a disk mill. After that it is sifted using a sieve of 100 mesh. Stored in a tightly closed container.

2.4 Making Cereal Drinks

Making cereal drinks is carried out in 2 steps, making flakes and mixing ingredients. This procedure refers to the method of [12]. The first step is the preparation of ingredients. The ingredients used include rice flour, banana flour, mung bean flour, corn bean flour, sugar, salt, margarine, water, liquid milk and egg yolk. The ingredients are dissolved in water and liquid milk of 100 ml each and stirred using a spatula until nothing coagulates. Cooking is done for 7 min on the stove while stirring constantly. Add egg yolks with percentages of 0%, 2%, and 4%, and add vanilla essence. Then the dough is placed on baking paper and baked for 35 min at a temperature of 120 °C. The process of reducing the size of the sheet into flakes (flakes) is carried out manually. In the final stage, the mixing of flakes with the ingredients of the drink mixture is carried out, so that cereal drink products are obtained. The ingredients of the drink mixture consist of milk powder, creamer, and refined sugar. The resulting flakes are processed into cereal drinks.

3 Results and Discussion

3.1 PH Value

Based on the results of the analysis of variance test ($p < 0.05$) it shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) has a real effect and its interaction (FxB) has no real effect on pH.

The results of this study showed that the average pH of cereal drinks ranged from 6.83–7.43 with the lowest pH indicated by the combination treatment F3T2 proportion of protani rice flour: banana flour which is 70: 5 with the use of 2% egg yolk and the highest yield is indicated by F1T1 treatment the proportion of protani rice flour: banana

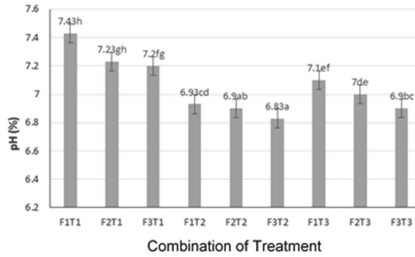


Fig. 1. pH value.

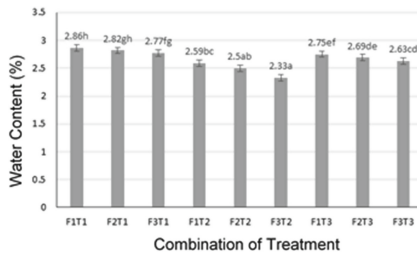


Fig. 2. Water content.

flour is 60: 15 with the use of 0% egg yolk. This average pH indicates that the pH of cereal drinks is still within the neutral pH range. So that the resulting pH value meets the milk quality standards set by the Indonesian National Standard (SNI, 2011) which is between 6.3–6.8, where this cereal drink is included in milk and cereals (Fig. 1).

3.2 Water Content

Based on the results of the analysis of variance test ($p < 0.05$) it shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) and its interaction (FxB) has a significant effect on water content.

It is known that the moisture content of cereal drinks based on protani rice flour ranges from 2.33% to 2.86%, of which the highest is produced by the combination of F1T1 treatments, the proportion of protani rice flour: banana flour is 60: 15 with the use of 0% egg yolk which produces a moisture content of 2.86%. Meanwhile, the combination of F3T2 treatment, the proportion of protani rice flour: banana flour, which is 70: 5 with the use of 2% egg yolk, produces the lowest moisture content of 2.33%. Referring to the quality requirements for cereal milk in SNI 01–4270-1996, it is stated that the water content requirement in cereal milk is a maximum of 3.0%. Based on these quality requirements, the water content in cereal drinks based on protani rice flour in this study has met the requirements of SNI 01-4270-1996 (Fig. 2).

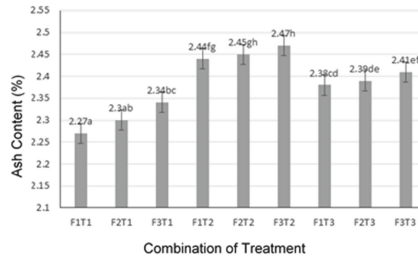


Fig. 3. Ash content.

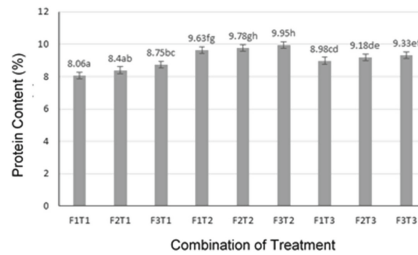


Fig. 4. Protein content.

3.3 Ash Content

Based on the results of the analysis of variance test ($p < 0.05$) it shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) and its interaction (FxB) has a significant effect on ash content (Fig. 3).

The results of the ash content analysis in this study are still within the *range* of research related to ash content, namely in rice flour by 0.34% [13], banana flour by 2.29% [14], green bean flour by 2.77% [15] and corn flour by 0.27% [16]. Referring to the quality standards of similar products, namely cereal milk described in SNI 01-4270-1996 concerning cereal milk, the required product ash content is a maximum of 4%. Figure 6 shows that the ash content of cereal drinks based on protani rice flour in this study is around 2.27–2.47% and has met the requirements set by SNI. The results of the analysis show that this cereal drink can be said to be suitable for consumption.

3.4 Protein Content

Based on the results of the analysis of variance test ($p < 0.05$) shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) and its interaction (FxB) has a significant effect on protein levels (Fig. 4).

It can be known that the highest protein content is produced by the combination of F3T2 treatment, the proportion of protani rice flour: banana flour is 70: 5 with the use of 2% egg yolk which produces a protein content of 9.95%. Meanwhile, with the combination of F1T1 treatment, the proportion of protani rice flour: and banana flour is 60: 15 with the use of 0% egg yolk, resulting in the lowest protein content of 8.07%.

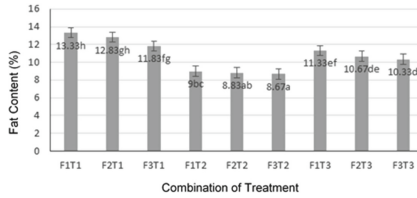


Fig. 5. Fat content.

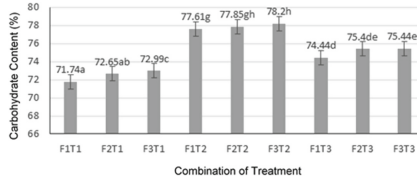


Fig. 6. Carbohydrate content.

Referring to the quality requirements for cereal milk in SNI 01–4270-1996, it is stated that the requirement for protein levels in cereal milk is at least 5.0%. Based on these quality requirements, the protein content in cereal drinks in this study has met the requirements of SNI 01–4270-1996 so it is good for consumption with good nutritional value content.

3.5 Fat Content

Based on the results of the analysis of variance test ($p < 0.05$) it shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) and its interaction (FxB) has a significant effect on fat content.

The results of this study showed that the average fat content of cereal drinks ranged from 8.67–13.33 with the lowest fat content indicated by the combination treatment F3T2 proportion of protani rice flour: banana flour was 70: 5 with the use of egg yolk 2% and the highest yield was shown by the FIT1 treatment the proportion of protani rice flour: banana flour is 60: 15 with the use of 0% egg yolk. Referring to the quality standards of cereal milk described in SNI 01–4270-1996, the required fat content of the product is 7%. This means that the fat content of cereal drinks based on protani rice flour in this study has met the requirements (Fig. 5).

3.6 Carbohydrate Content

Based on the results of the analysis of variance test ($p < 0.05$) shows that the treatment of the proportion of flour (F) with the percentage of egg yolk (T) and its interaction (FxB) has a significant effect on the carbohydrate content.

The percentage of carbohydrate content in cereal drinks in this study ranged from 71.74%–78.21%. The combination of F3T2 the treatment, the proportion of protani rice flour: banana flour is 70: 5 with the use of 2% egg yolk which results in the highest percentage of carbohydrate content of 78.21%. The lowest carbohydrate content of

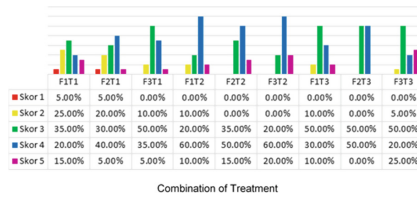


Fig. 7. Overall sensory assessment graph. Description: Score 1 = Strong dislike; Score 2 = Dislike; Score 3 = Few Likes; Score 4 = Likes; Score 5 = Really Like

71.74% is produced by the combination of F1T1 treatment, the proportion of protani rice flour: banana flour is 60: 15 with the use of 0% egg yolk. Referring to SNI 01-4270-1996 which is that the quality requirement for cereal drinks contains a minimum carbohydrate of 60.0%. Based on the quality requirements of SNI 01-4270-1996, cereal drinks in this study met the minimum quality requirements for carbohydrate content which shows that this product has good quality or quality.

3.7 Sensory (Overall)

The results of a descriptive analysis on the combination of the treatment of adding different proportions of flour and the percentage of egg yolk (FxT) to the overall attributes of cereal drinks based on protani rice flour by panelists are presented in Fig. 7.

Based on the results of the descriptive analysis in Fig. 7, it can be seen that the panelists stated that they really disliked each combination of cereal drink treatments. The results of testing the panelists' perceptions of color, aroma and taste and cereal drinks showed varied results, but panelists tended to like cereal drinks with a higher proportion of protani rice and with the addition of 2.5% egg yolk (F3T2), 60% expressed liking and 20% said they really liked it.

4 Conclusion

Flour variations affect pH, moisture content, ash content, fat content, protein content, carbohydrates, and sensory. The addition of yellow increases the pH value, ash content, protein content and sensory while the water, fat and pH content decreases. The best combination of treatments based on flour variations and egg yolk percentages is the F3T2 treatment (70 g of protani rice flour, 5 g of banana flour, 10 g of mung bean flour, 15 g of corn flour and 2% egg yolk) with the results of physicochemical analysis, namely pH value of 6.83, wet content of 2.33%, ash content of 2.47%, fat content of 8.67%, protein content of 9.95%, and carbohydrates of 78.2%.

Acknowledgments. The authors thank to LP Jenderal Soedirman University who has provided funds for the Professor Facilitation Research 2022.

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