Comparison of acceptability analysis of goat milk yogurt fortification with various rice bran flour

C K Ningtyas¹, A E P Haskito*²
¹Faculty of Veterinary Medicine Undergraduate Student, Brawijaya University, Puncak Dieng Eksklusif Malang
²Faculty of Veterinary Medicine Lecturer, Brawijaya University, Puncak Dieng Eksklusif Malang
Email: drherika1989@gmail.com

Abstract. Goat milk yogurt is among dairy products with a lot of health benefits, but still unfavorable in the population. To increase community acceptability towards goat milk yogurt, fortification with white, red, and black rice bran flour was attempted. The purpose of this research is to create goat milk yogurt with white, red, and black rice bran flour and analyze acceptability differences between each yogurt type. The yogurt used in this research is milk product fermented in Lactate Acid Bacteria (LAB) *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, and *lactobacillus acidophilus*. This research is an experimental research using Completely Randomized Design (CRD) with one factor in the form of fortification with white rice bran flour 4%, red rice bran flour 4%, and black rice bran flour 4% into goat milk, and then fermented with the help of LABs into yogurt. Acceptability analysis was done by using the hedonic test on the following criteria: sour taste, goat smell, rice bran smell, and yogurt consistency. The hedonic test involved 30 panelists. Data analysis used the Kruskal Wallis test followed by the Mann Whitney test. The result of the research showed: (1) significant difference towards sour taste; (2) no significant difference towards goat smell, rice bran smell, and yogurt consistency; (3) goat milk yogurt fortified with black rice bran flour was the most favored by the panelists.

Keywords: acceptability, fortification, hedonic, rice bran, yogurt

1. Introduction
Milk is a product with high nutrition good for health but is easily spoiled. One of the efforts in preventing and reducing damage to milk products is by fermenting milk. Milk fermentation is one of milk preservation techniques involving milk sugar metabolism, which turns sugar into lactic acid. Among fermented milk products circulating in the population today is yogurt. According to SNI 01-2981 the year 2009, yogurt is a product obtained from milk fermentation or milk reconstituted by using *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, and other suitable lactic acid bacteria with or without the addition of other acceptable food stuff[1]. The main ingredient of fermented milk may originate from goat milk.

Goat milk was chosen for its advantages, such as complete nutritional value, easily digestible fat and protein, and does not contain β-lactoglobulin which is a compound often act as allergen[2]. Creating goat milk yogurt is superior in terms of nutritional value compared to fresh goat milk.
During fermentation, the organism in yogurt breaks down lactose, which caused yogurt lactose content to decrease up to 30%. Thus, yogurt is the better one to be consumed by people with lactose intolerance. Moreover, the same microorganisms also break down protein. This is shown by the high level of proline and glycine amino acid content, making protein in yogurt easier to be digested. Milk fat also changes, where most fat turn into fatty acid. Yogurt contains a higher level of linoleate fatty acid compared to fresh milk[3].

Nowadays, yogurt has often been produced and circulated in the community. However, in its production and marketing yogurt still faces many problems, such as the lack of variety in form and taste and the community’s lack of knowledge on its health benefits which in turn makes them less likely to feel the need in consuming yogurt. Yogurt added with flavoring will increase palatability and consumer acceptability. To increase product palatability as well as increasing the level of antioxidant and fiber that are good for health, rice bran flour fortification was added on yogurt.

Rice bran is a by-product of rice seed into the rice. In the past, many thought that rice bran had little benefit and treated it as merely livestock feed. With the advances of technology, rice bran has been used in the various food industry sector. Rice bran is known to contain active compounds oryzanol, tocopherol, and folic acid that can be used as a functional food. Rice bran is also high in starch, protein, fat, vitamin, and minerals which are beneficial for humans. Rice bran could be produced from white rice, red rice, and black rice[4]. Various researches have shown that the darker the rice (pigment) the higher the antioxidant content[5].

The purpose of this research is to create goat milk yogurt with white, red, and black rice bran flour, and then analyze the acceptability differences of each yogurt. The benefit of this research is science development, especially in the field of food bioprocessing and technology.

2. Material and Methods
This research was conducted in the Veterinary Public Health Laboratory, Faculty of Veterinary Medicine, Brawijaya University. The materials and tools used in the creation of goat milk yogurt fortified by various rice bran flours are fresh goat milk, rice bran flour (white, red, and black), yogurt starter (Lactobacillus bulgaricus, Streptococcus thermophilus, Lactobacillus acidophilus), aluminum foil, cotton, autoclave, stove, pan, Scot bottle, mercury thermometer, water pail, digital weight, graduated glass, glass stirrer, micropipette, incubator, pH meter, blender, and refrigerator.

This research was conducted through 3 stages, which were: (1) yogurt-making; (2) hedonic test; and (3) data analysis. Yogurt making began from pasteurizing fresh goat milk with a High-Temperature Short Time (HTST) method in 72°C for 15 seconds. Pasteurized milk was then set aside until its temperature reached 45°C and then continued by inoculating mother culture 3% and added with 4% of white rice bran, red rice bran, or black rice bran respectively before then homogenized. After homogenization, the solution was incubated in 45°C for 2-3 hours until they reached pH 4.5-5 and yogurt particular sour taste, smell, and smell were obtained. For the hedonic test, each goat milk yogurt rice bran flour fortification type (white, red, and black) were homogenized with the blender. Each yogurt type was poured into a small cup, as many as 30 cups for each yogurt. After the hedonic test was conducted with each respondent, the most preferable formula was observed with a sour taste, goat smell, rice bran aroma, and yogurt consistency as parameters.

This research is an experimental research which used Completely Randomized Design (CRD) with one factor, which was the addition of 4% white rice bran flour, addition of 4% red rice bran flour, and 4% black rice bran flour into goat milk and then fermented with the help of LABs into yogurt. Acceptability analysis was done by the hedonic test, and then the data was analyzed by using the Kruskal Wallis test followed by the Mann Whitney test.

3. Result and discussion
3.1 Sour Taste
Hedonic test on sour taste showed a significant difference for every group of goat milk yogurt fortified by white, red, and black rice bran flour (P<0.05). The hedonic value of goat milk yogurt fortified by rice bran flour ranged around 1.25-1.78. The most favorable sour taste in hedonic value
for goat milk yogurt was goat milk yogurt fortified by black rice bran flour with 1.78 while the lowest value belongs to goat milk yogurt fortified by red rice bran flour with a hedonic test value of 1.25. A graph illustrating the average hedonic value of sour taste for goat milk yogurt fortified by white rice bran flour, red rice bran flour, and black rice bran flour is presented in Table1. Sour taste in yogurt is influenced by LAB activity which gives a sour taste as a product of carbohydrate break down in rice bran and glucose in goat milk. The higher the carbohydrate content in rice bran flour, the higher the sour taste in yogurt. This is in accordance with Djaafar and Rahayu (2006) which stated that during fermentation, LAB grows rapidly and produces lactic acid[6]. Carbohydrates present in rice bran would be broken down into simple sugar as LAB nutrition and the end process would change sugar into lactic acid. Various kind of rice bran has various level of carbohydrate content with white rice bran having higher carbohydrate level compared to black rice and red rice[7].

![Figure 1. Hedonic Test Scoring Value of Sour Taste](image)

3.2 Aroma

The average value of the hedonic test on the aroma of goat milk yogurt fortified by white, red, and black rice bran flour could be seen in Figure 2 for goat aroma and Figure 3 for rice bran aroma. Based on the analysis result, goat milk yogurt fortified by white, red, and black rice bran flour showed no significant difference (P>0.05) on goat and rice bran aroma. The value of goat aroma in goat milk yogurt fortified by rice bran flour ranged between 1.50-1.55 while the value of rice bran aroma in goat milk yogurt fortified by rice bran flour ranged between 1.47-1.58.

![Figure 2. Hedonic Test Scoring Value for Goat Aroma](image)
According to Legowo et al. (2006), the aroma and taste of goat stick strongly to goat milk\textsuperscript{8}. Several types of research on the addition of other materials such as fruits or grains may affect aroma, taste, and palatability of goat milk. This is caused by the pasteurization heating process which evaporates fatty acid in goat milk and the addition of fortification lowered the unique aroma and taste of goat.

Consistency

Yogurt consistency with the addition of rice bran flour of various types of rice (white, red, and black) based on a hedonic test is provided in Figure 4. The analysis result showed that the addition of white, red, and black rice bran flour did not have a significant effect ($P>0.05$) to yogurt consistency. According to Manab (2008), yogurt consistency is formed because the casein in milk is coagulated into gel structure by bacterial activity\textsuperscript{9}. During this coagulation process, consistency changes happened and during this phase, the flavor is created. Other than bacterial activity, the addition of rice bran also affects yogurt consistency with the presence of fiber in rice bran.
3.3 Overall score

![Overall Score Diagram]

**Figure 5.** Hedonic test scoring value for the overall factor

Respondent scoring on flour fortification of various rice bran types on yogurt showed that overall most preferred goat milk yogurt fortified by black rice bran flour, as shown in Figure 5. This is because the sour taste in yogurt fortified with black rice bran flour was not as strong as the others and thus more preferred. Someone's preferences on a product are influenced by several factors, among them are color, taste, looks, high nutritional value, and benefits on consumers' body. Most people prefer yogurts that are not so sour and still have a sweet taste. Thus, yogurt sourness influences respondent preferability on yogurt [10].

4. Conclusion

Fortification by various rice bran flour has a significant difference in sour taste characteristic but has no significant difference against goat aroma, rice bran aroma, and yogurt consistency. Goat milk yogurt fortified by black rice bran flour is the most preferred treatment according to respondents with scoring value on sour taste being 1.78 (like), rice bran aroma 1.50 (like), consistency 1.60 (like), goat aroma 1.50 (like), and overall 1.71 (like).

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