Organoleptic Properties Evaluation of Goat Milk Yoghurt with White Rice Bran Flour Fortification

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Abstract: Yoghurt is a functional food with various health benefit. Goat milk yoghurt contains bioactive peptides which have antioxidant potential. Rice bran is known for its good nutrition and high fiber and rich in bioactive components as potential antioxidant. White rice bran flour fortification into yoghurt processed from goat's milk is expected to increase the yoghurt's nutritional value, especially in fiber and antioxidants. The aim of this research was to create yoghurt from goat's milk fortified by white rice bran flour and to analyze said yogurt with hedonic test and hedonic quality test for organoleptic properties namely sour taste, goat aroma, bran aroma, and consistency. This research's methodology was an experimental study which used a Completely Randomized Design (CRD) method for one treatment with five repetitions. The treatment factor is fortificationby 4% white rice bran flour in pasteurized goat milk which has been added with starter of *Lactobacillus bulgaricus, Streptococcus thermophilus*, and *Lactobacillus acidophilus* 3% during incubational together until the milk transformed into yoghurt. The hedonic test and hedonic quality tests involved 30 panelists. The data is analysed by calculating average values. The results showed that panelists enjoyed overall characteristics such as sour taste, goat aroma, bran aroma, and yoghurt's consistency. The panelists stated that fortified goat milk yogurt had sour taste, no goat meat and bran aroma, with adequately solid consistency.

1 INTRODUCTION

Freshmilk is one of animal derived products rich in nutrition, which is obtained from dairy livestock, be it cow, buffalo, or goat. Goat milk in general is produced by Peranakan Etawah (PE), or Etawa Crossbreed goat (Atmiyati, 2001). Goat milk is still relatively unfavorable by customer for exuding particular musky buck smell (Sampurno and Chayanti 2017). Thus, diversification effort is required to make goat milk favored by consumers. One of these efforts is by developing yoghurt. Yoghurt is milk product fermented by lactic acid bacteria (LAB) in semi-solid form which possessed texture between liquid milk and cheese (Effendi et al. 2009). According to Balia et al. (2011), LABs that are most often used for milk fermentation are *Streptococcus thermophilus* and *Lactobacillus bulgaricus*.

Milk processing via fermentation does not only improve nutritional value but can also be used to eliminate particular characteristic smell of fresh milk, such as tangy and buck smell characteristic of goat milk. In a research by Al-Baarii et al. (2003), fermentation in goat milk may produce volatile compounds consisted of acetaldehyde, diacetyl, and ethanol, which may mask the smell of goat milk. Other than fermentation, addition or fortification of certain materials can also fix the profile of goat milk and fermented goat milk.

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Rice bran, a by-product of rice processing, is gaining a lot attention as functional food in the last few years. This is related with rice bran functionality for health (Tuarita et al. 2017). Rice bran is the by-

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product of rice milling, obtained from the outer layer of rice caryopsis (Henderson et al. 2012). Until now, development of rice bran as functional food is still hindered by several problem, such as the lack of people awareness about rice bran benefit, rice bran usage limited as livestock feed, unstandardized rice bran quality, and the lack of interest from downstream industry in developing rice bran. This becomes a particular challenge for rice bran development considering its promising health potential (Tuarita et al. 2017). Rice bran's role as functional food source potential for health can be seen from its bioactive and fiber components. Fibers in rice bran consist of cellulose, hemicellulose, pectin, arabinosilan, lignin, and β-glucan. Bioactive component in rice bran consist ofγ-oryzanol,ferulic acid, caffeic acid, tricine,kumaric acid, phytic acid, isoform of vitamin E (α-tocopherol, γ-tocopherol, tocotrienol), phytosterol (β-sitosterol, stigmasterol, campesterol), andcarotenoid (α-caroten, β-caroten, lutein, lycopen) (Henderson *et. al*., 2012). Based on tthose facts, it is important to explore the potency of goat milk fermented into yoghurt fortified by rice bran, which in this research especially using white rice bran, as a candidate of natural functional food high in fiber and antioxidant. This research was hoped to improve national innovation system in the development of natural functional food product based on fermented goat milk fortified by white rice bran flour.

2 MATERIALS

Yoghurt was made by yoghurt started containing 3 BAL strains: *LLactobacillus bulgaricus, Streptococcus thermophilus*, and*Lactobacillus acidophilus* (Yogourmet®, Lyo-SAN INC: 500 Aeroparc, C.P. 589, and Lachute, QC. Canada, J8H, 464).White rice bran flour used was dr.Liem®. Goat milk was obtained from Etawa Crossbreed (PeranakanEtawa—PE) in community farm Dr. Goat®.

3 METHODS

3.1 Making of Goat Milk Yoghurt Fortified by White Rice Bran Flour

Mother working culture was made by adding 0.35 gram of starter into 70 ml pasteurized goat milk and incubated in 45◦C for 4 hours until its pH reached 4,4-4,5. Yoghurt was then made by adding 3% of working mother culture into 480ml of pasteurized goat milk, added by white rice bran flour 4% in, and then incubated in 45◦C for 4 hours until it reached pH 4,5-5.

3.2 Organoleptic Test with Hedonic and Hedonic Quality Test Method

Hedonic test is the most used test in measuring the level of favorability or acceptance towards a product. This level of preference is called hedonic scale: extremely liked, very liked, liked, fairly liked, and disliked. Hedonic quality test is used to identify important sensory properties in a product and to give information about the level or intensity of the property. Properties to be determined in this research are sour taste, goat smell, bran aroma, and yoghurt existence. This research used 30 panelists with the following inclusion characteristics: has done organoleptic test in the past, has no allergy against goat milk, and is familiar with rice bran. Products and materials were provided in every panelist desk in the following manners: (1) providing a cup of goat milk yoghurt fortified with white rice bran flour, (2) providing a cup of drinking water for mouth washing when panelists would like to re-taste product, and (3) providing questionnaire for organoleptic test.

3.3 Data Analysis

Data on sour taste, goat smell, rice bran aroma, and yoghurt consistency were analyzed by calculating the average value of every properties through hedonic and hedonic quality test.

4 RESULTS

Table 1: Average Value of Organoleptic Test with Hedonic Method.

Treatment	Organoleptic Properties			
	Sour Taste	Goat Smell	Rice Bran Aroma	Consistency
Goat Milk Yoghurt Fortified by White Rice Bran Flour	1.70	2.20	2.17	2.37

Annotation :Hedonic Scale (1) : Dislike; (2) :neutral; (3) : like.

In organoleptic test with hedonic method, the result of sour taste criteria appeared to be 1.70 in hedonic scale. This value showed that sour taste is between 1 and 2 with the result leaning to 2 scale value. This means panelists' preferences on sour taste as "neutral" for goat milk yoghurt fortified by white rice bran flour. The result of goat aroma has the average value of 2.20. This showed that for goat smell criteria, it is between 2 to 3 with the scale leaning towards 2. This means, panelists' preferences on goat smell criteria was on "neutral" for goat milk yoghurt fortified by white rice bran flour. For white rice bran criteria, the value was 2.17.

This means that for the given criteria, it was between 2 to 3 with the value leaning to 2. This means, panelists' preferences for white rice bran aroma as "neutral" for goat milk yoghurt fortified by white rice bran flour. For consistency criteria, the value was 2.37. This means that for the given criteria, it was between 2 to 3 with the value leaning to 2. This means, panelists' preferences for consistency as "neutral" for goat milk yoghurt fortified by white rice bran flour.

Table 2: Average Value of Organoleptic Test with Hedonic Quality.

Treatment	Organoleptic Characteristic			
	Sour Taste	Goat Smell	Rice bran Aroma	Consistency
Goat Milk Yoghurt Fortified by White Rice Bran Flour	2.33	2.33	1.97	1.73

Annotation: Hedonic quality scale as follow : Sour taste : (1) inadequate sour taste; (2) sour; (3) very sour Goat smell : (1) fairly smell of goat; (2) no goat smell; (3) smell of yoghurt Rice bran aroma : (1) rice bran rancid smell; (2) does not smell; (3) rice bran characteristic good smellConsistency : (1) soggy; (2) adequate solidity; (3) too solid.

In organoleptic test by hedonic quality method, the result of sour taste had the average value of 2.33. This value meant the level/intensity of sour taste was within "sour". The result of goat smell criteria had the average value of 2.33. This value meant the level/intensity of goat smell was within "no goat smell". The result of rice bran aroma criteria had the average value of 1.97. This value meant the level/intensity of rice bran aroma was within "no smell of rice bran". The result for consistencyhad the average value of 1.73. This value meant the level/intensity of consistency criteria was within "adequate solidity".

5 DISCUSSION

The sour taste of yoghurt came from the presence of lactic acid as the metabolite product of BALs activity as they utilize lactose within milk as a source of carbon and energy (Azizah et al. 2013). Sour taste in yoghurt is closely related to yoghurt taste. Lactic acid produced during fermentation process determines the sourness of yoghurt (Anggrainin et al. 2018). In goat milk yoghurt fortified by white rice bran flour, panelist preferences assessment on sour taste was neutral (average value 1.70) within level/intensity being sour. This indicated that the use of *Lactobacillus bulgaricus, Streptococcus thermophilus*, and *Lactobacillus acidophilus*starters could influence the sour taste of yoghurt. According to Effendi et al. (2009) Lactobacili family forms the main components of yoghurt, which are sour taste of lactic acid and particular smell of sour substance. *Streptococcus thermophilus*forms lactic acid, diacetyl and acetoin compounds, which would provide characteristic smell and taste during fermentation process. General consistency of yoghurt is soft and thick. This is caused by the degradation of protein molecules into peptides by LABs activity during fermentation process that changed milk particles into smaller molecules (Lizyanti et al. 2014). Yoghurt consistency is influenced by pH. If yoghurt pH is out of the range of normal milk pH, casein protein may form whey protein that had undergone denaturation during pasteurization, which is the initial phase of yoghurt making process (Azizah et al. 2013). Yoghurt characteristic consistency is also influenced by LAB activity during fermentation, such as *Streptococcus thermophilus*, for they are able to produce lactase enzyme, which influenced milk thickness. In principle, lactase enzyme is used to degrade lactose and produce lactic acid, which caused milk protein instability, and thus also among the cause of increasing thickness during yoghurt making (Lizayanti et al. 2014). In goat milk yoghurt fortified by white rice bran flour, panelists assessment on consistency is neutral (average value of 2.37) with level/intensity being adequately solid.

This indicated that fortification by white rice bran flour as much as 4% did not significantly influence yoghurt consistency, even if white rice bran flour is known to have relatively high crude fiber content.

Goat milk exhibit characteristic "prengus" or musk smell that is relatively strong, which is not found in other livestock milk and thus unfavored by customers (Al-Baarri et al. 2003). The characteristic smell of goat milk is caused by goat milk lipid content which contain short and average chain lipid acids such as capric lipid acid, caprylate lipid acid, and caproate lipid acid that are easily turn volatile (Setyani et al. 2003; Balia et al. 2011). Goat milk processing into fermented milk was hoped to eliminate or at least to reduce the must smell (al-Baarri et al. 2003). Good yoghurt smell is if the characteristic small of milk (musky, tangy) can be eliminated by fermentation. Yoghurt characteristic smell is caused by fermentation which forms volatile compounds acetaldehyde, diacetyl, and ethanol. Acetaldehyde is a volatile compound that gives specific aroma to fermented milk. Diacetyl will give "pleasant" aroma of fermented milk. Ethanol is also a volatile compound exists in both fermented and unfermented fresh cow milk. Higher ethanol content is a relatively important marker in the elimination of unfavored aroma in fresh milk before fermentation (Al-Baari et al. 2003). In goat milk yoghurt fortified by white rice bran flour, the preference value from panelists for goat smell was neutal (average value of 2.200 with level/intensity of goat smell being "no goat smell". This showed that goat milk fermentation process into yoghurt with the help of *Lactobacillus bulgaricus, Streptococcus thermophilus*, and *Lactobacillus acidophilus*was able to eliminate characteristic musky smell of goat milk.

Aroma is related to sense of smell. Aroma considered to be pleasant comes out of the right blend of different components. Rice bran has a very strong and unique aroma. This smell comes from tocopherol oil in rice bran, which is a very volatile compound (Inggita et al 2015; Sarbini et al. 2009). If air containing volatile compound from rice bran floated in turbulence within the gap of nasal cavity, upon contact with the tip of olfactory cell, the aroma could be smelled (Rasbawati et al. 2019). For goat milk yoghurt fortifiedby white rice bran flour, panelist preferences assessment for rice bran smell was neutral (average 2.17) with level/intensity being "does not smell rice bran" (average value 1.97). This showed that rice bran flour fortification did not cause prominent rice bran smell in yoghurt at 4% concentration, because of the relatively small concentration of the flour.

6 CONCLUSIONS

Based on the result of this research, addition of white rice bran flour in 4% concentration into milk goat yoghurt making process produced yoghurt with organoleptic characteristics being sour, did not smell of goat or rice bran, and having medium consistency/adequate solidity

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