Consumer preference on milk crackers made from goat milk based on organoleptic test in Medan, Indonesia

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Abstract. The purpose of this research is to determine consumer preference on milk crackers made from goat milk based on organoleptic test in Medan, Indonesia. Thirty consumers were determined by using judgement sampling techniques of organoleptic to assess the satisfaction of consumer to goat’s milk cracker included colour, taste, crispiness, flavour and overall acceptance of goat’s milk cracker made from goat milk after frying. Organoleptic test resulted in processing milk crackers made from goat milk with various variations in the addition of goat milk into the basic formula produced a positive effect on colour, taste, crispness, aroma and overall acceptance of milk crackers. Organoleptic test resulted in processing milk crackers with different drying time do not significantly affected the colour, taste, crispness, aroma and overall acceptance of milk crackers. The most preferred treatment by panellists was the addition of 1 litre of goat milk contained a carbohydrate of 48.8%, protein 3.52% and fat 34.6%.

1. Introduction

Milk is one of the protein sources for humans. However, as cow’s milk is not available or not affordable to millions of Indonesian people, family consumption of goat’s milk as an alternative is important in the prevention of under-nutrition and malnutrition. People consider that milk, especially goat’s milk, provide health benefit for them, and it greatly improves the diet of many rural families in Indonesia. Such situation provides opportunities for prospective dairy goat farms to develop and to supply milk in Indonesia [1]. Goats were among the first farm animals to be domesticated. As indicated by the archaeological evidence, they have been associated with man in a symbiotic relationship for up to 10,500 years in Middle East [2]. Goats are mainly kept for meat production and their milk is rarely consumed. However, nowadays, there is an increasing consumption of goat milk due to its better-quality such as lower cholesterol, higher vitamin and valuable amino acid than cow milk, also can be used as infant food [3,4]. Goat milk has been used several medicinal values as therapeutic virtues for dietetic and ulcers problems or people allergic to cow milk and inflammatory...
diseases which led to an increased interest in goats’ milk as a functional food, and it now forms a part of the current trend to healthy eating [3].

Goat milk has also been used several medicinal values as therapeutic virtues for dietetic and ulcers problems or people allergic to cow milk and inflammatory diseases which led to an increased interest in goats’ milk as a functional food, and it now forms a part of the current trend to healthy eating [5]. Composition comparison of goat milk with other ruminants (cow, sheep, and horse) and human milk is presented in Table 1 [6,7]. Goat milk has been well-known as useful human consumption due to its nutrition content and medical for many diseases [4]. Benefits of goat’s milk are more potent and better when compared to other milks on the market. Goat’s milk benefits are superior to cow’s milk, as it is richer than cow’s milk in some important nutrients: vitamin A, niacin, choline, and inositol; it is poorer in folic acid. Moreover, in term of efficacy and benefits of goat’s milk for health, goat’s milk can also be taken as a skin care benefits, such as a face mask so that the face looks fresh, healthy, moist, not dull and dry, and can shrink pores. Finally, goat’s milk is easier to digest, is less allergenic, and can be consumed by all age groups. Therefore, the selling price of fresh goat milk is still quite high, namely between 25,000-60,000 IDR/litre [1].

Nowadays, there is an increasing interest in goat milk in the world, resulting with increasing the production of goat's milk and its products. Therefore, more information is needed on production and processing of goat milk [8,9]. Trend of research results on the level of consumer interests to goat’s milk show that attributes for nutrient content of goat’s milk is very important for consumers. It is very important to ensure the consumers that the products they consume are safe and healthy [1]. In this study we conducted organoleptic test by five factors: colour, taste, crispiness, flavour and overall acceptance of goat's milk crackers made from goat milk in Medan, Indonesia.
Table 1a. Composition comparison of goat milk with other ruminants (cow, sheep, and horse) and human milk [6]

| Component       | Value          | Goat     | Cow      | Sheep    | Mare     | Human  |
|-----------------|----------------|----------|----------|----------|----------|--------|
| Fat (g/kg)      | Mean (Min-Max) | 41.0 (30-60) | 36.1 (33-54) | 75.0 (50-90) | 12.1 (5-20) | 36.4   |
|                 |                | 34.0 (30-36) | 32.5 (31-39) | 54.5 (45-70) | 21.4 (15-28) | 14.2   |
| Crude protein   | Mean (Min-Max) | 47.0 (42-50) | 48.8 (44-49) | 49.0 (41-59) | 63.7 (58-70) | 67.0   |
| Lactose (g/kg)  | Mean (Min-Max) | 7.7 (7-8)   | 7.6 (7-9) | 8.5 (8-9) | 4.2 (3-5) | 2.2    |
| Ash (g/kg)      | Mean (Min-Max) | 670 (660-690) | 674 (650-712) | - (390-550) | 480 (630-700) | 677    |
| Gross energy (kcal/kg) | Mean (Min-Max) | 12.1 (5-20) | 21.4 (15-28) | 63.7 (58-70) | 480 (630-700) | 677    |

Table 1b. Average composition of milk of various mammals [7]

| Species | Total solids | Fat | Lactose | Protein | Ash |
|---------|--------------|-----|---------|---------|-----|
| Human   | 12.57        | 3.70 | 6.98    | 1.63    | 0.21|
| Cow     | 13.10        | 4.00 | 4.90    | 3.40    | 0.70|
| Goat    | 12.86        | 4.09 | 4.20    | 3.71    | 0.78|
| Camel   | 12.39        | 5.40 | 3.30    | 3.00    | 0.70|
| Sheep   | 16.43        | 6.18 | 4.17    | 5.15    | 0.93|

2. Materials and methods

2.1. Experimental location
This research was carried out for three months in Asam Kumbang Sub-district, Medan City, Sumatra Utara Province, Indonesia. Organoleptic test of milk crackers made from goat milk was carried out at the Laboratory of Animal Husbandry Study Program, Faculty of Agriculture, Panca Budi University, Medan.

2.2. Method of research

Table 2. Basic formula of making milk crackers from goat milk [10]

| Ingredients     | T1 | T2 | T3 |
|-----------------|----|----|----|
| Goat milk       | G/L| G/L| G/L|
| Tapioca flour   | 0.5| 0.75| 1.0|
| Wheat flour     | 900| 900| 900|
| Red onion       | 300| 300| 300|
| Coriander       | 150| 150| 150|
| Salt            | 10 | 10 | 10 |
| Baking soda     | 2  | 2  | 2  |
| Water           | 1.0| 0.75| 0.5|

The hedonic evaluation test involves asking consumers to rate their preference to milk crackers made from goat milk ranged from 1 to 5 (1 = very dislike, 2 = dislike, 3 = ordinary, 4 = like and 5 =
very like). The basic recipe formula of milk crackers from goat milk mixed with the ingredient composition (Table 2) suggested by [10].

2.3. Research parameters
Organoleptic testing is carried out based on the organoleptic test method, which is the acceptance testing group or the hedonic test. Samples were presented by random numbering and panellists as many as 30 people were asked to rate their preferences for colour, taste, crispness, aroma and overall acceptance of milk crackers made from goat milk after frying.

2.4. Data analysis
All collected data is processed by analysis of variance, and followed by [11].

![Figure 2](image-url)

**Figure 2.** Ingredients used in making milk crackers from goat milk and their processing from mixing, drying and frying

3. Results and discussion

3.1. Organoleptic test for goat milk crackers
The results of the organoleptic tests on milk crackers made from goat milk are presented in Table 3.

3.2. Colour of milk crackers
The colour of goat's milk crackers can be easily distinguished when the crackers are still raw, but after frying the colour of the goat's milk crackers in all treatments looks the same (2.37 – 3.90: “2 = dislike – 3 = ordinary”). The colour of raw milk crackers getting bright the more addition of goat milk, the colour of the crackers getting brighter. The colour of milk crackers made from goat milk is influenced by the composition of tapioca flour and wheat flour as found by [12], who reported that the more the amount of tapioca flour added then the colour of milk crackers will be whiter because tapioca flour can be used as an ingredient of white colouring in crackers. Colour food products are also part of the assessment of food product acceptance.

3.3. Taste of milk crackers
The effect of drying milk crackers made from goat milk does not significantly affected (P > 0.01) the taste of milk crackers (4.00 – 4.30: “4 = like – 5 = very like”) because the taste of crackers is influenced by the ingredients used in making milk crackers. This is in accordance with [12] that the taste of a food ingredient can come from the food itself and if it gets processed then the taste can be influenced by the ingredients added to it during the processing.
Table 3. Recapitulation of the results on organoleptic test of the addition of goat milk and drying time of milk crackers made from goat milk

| Treatments | Drying time | Mean scores |
|------------|-------------|-------------|
|            | Colour      | Taste       | Crispness  | Aroma      | Overall acceptance |
| T1         | L1          | 3.37a       | 4.03ab     | 4.00a      | 3.60cd            | 4.00a                |
|            | L2          | 3.50bc      | 3.93a      | 4.03a      | 3.50a            | 3.97a                |
|            | L3          | 3.40c       | 4.00a      | 4.10ab     | 3.50a            | 4.00a                |
| T2         | L1          | 3.50bc      | 4.06ab     | 4.17bc     | 3.57bc           | 4.20bc               |
|            | L2          | 3.53bc      | 4.00a      | 4.10ab     | 3.46a            | 4.20bc               |
|            | L3          | 3.57cd      | 4.06ab     | 4.17bc     | 3.53bc           | 4.16cd               |
| T3         | L1          | 3.90f       | 4.30bc     | 4.37e      | 3.87f            | 4.33cd               |
|            | L2          | 3.70de      | 4.33e      | 4.23cd     | 3.70de           | 4.23bc               |
|            | L3          | 3.80ef      | 4.30bc     | 4.30de     | 3.80ef           | 4.33d                |

Note: The numbers followed by superscript letters in each column are not significantly different (P > 0.01)

3.4. Crispness of milk crackers
Crankiness of goat's milk crackers (4.00 – 4.30: “4 = like”) is influenced by the thickness of sliced, the time of dryness and the frying of goat's milk crackers, besides the composition of the flour ingredients used also affected the crispness of goat's milk crackers. The best composition of flour ingredients is 3: 1 where the amount of tapioca flour is 3 parts and the amount of flour is 1 part [10,12]. Milk crackers can be said to be crispy when eaten not hard or easily broken. This is in accordance with [13] that crispness is the most important part for receiving frying products such as milk crackers. According to [12], the combination of tapioca flour and flour will affect the crispness of milk crackers. The more amount of wheat flour that is added to the process of making milk crackers, the resulting crackers are very hard and not easily destroyed when eaten, while the more amount of tapioca flour used compared to the amount of wheat flour, the resulting milk crackers are crispier.

3.5. Aroma of milk crackers
The amount of goat milk added to the process of making crackers will affect the aroma of the milk crackers (3.46 – 3.80: “3 = ordinary”), the more the amount of goat milk added to the basic formula of milk crackers, the aroma of goat milk will increase. This is in accordance with [12] the more amount of goat milk added to the basic formula, the level of aroma produced is sharper, while the less amount of milk added, the sharp the aroma produced by goat milk. The results of the analysis of variance in the effect of long time drying milk crackers also did not significantly affect the aroma of milk crackers (P > 0.01). The results of the interaction of the addition of goat milk and milk cracking drying time also did not significantly affect (P > 0.01) the aroma of milk crackers. The amount of milk added into the process of making milk crackers will affect the aroma of milk crackers so that the aroma of goat milk will be increasingly felt [12].

3.6. Overall acceptance of milk crackers
The overall acceptance of milk crackers included the colour, the taste, the crunchiness of milk crackers and the aroma of milk crackers (3.97 – 4.33: “3 = ordinary – 4 = like”). The effect of drying milk crackers does not significantly affect (P > 0.01) the overall acceptance of milk crackers and the results of the interaction of the addition of goat milk and the drying of milk crackers have also no significant (P > 0.01) effected on the overall acceptance of milk crackers [12].
4. Conclusions
Organoleptic test resulted in processing milk crackers made from goat milk with various variations in the addition of goat milk into the basic formula produced a positive effect on colour, taste, crispness, aroma and overall acceptance of milk crackers. Organoleptic test resulted in processing milk crackers with different drying time do not significantly affected the colour, taste, crispness, aroma and overall acceptance of milk crackers. The most preferred treatment by panellists was the addition of 1 litre of goat milk contained a carbohydrate content of 48.8%, protein 3.52% and fat 34.6%.

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