

## ANALYSIS OF DEVELOPED YOGHURT USING MILK FROM GOAT AND COW REARED AT LOCAL FEED IN SLEMAN

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### ABSTRACT

The consumption rate of milk in Indonesia was considered very low, due to partly of lactose intolerance of adults and strange flavor of milk products. Fermented milk was developed to respond these problems. Yoghurt is one of a very popular fermented milk considered useful for the health of consumers, especially who suffers from lactose intolerance. This research had been conducted to develop a Yoghurt using goat and cow milk. The change of carbohydrate contents during processing were followed by HPLC using aminex HPX 87H column and at the same time, some trained panelists (6) had detected the basic taste of these products (sweetness, acidity, saltiness, bitterness) as well as their preferences. The results indicated that the reduction of lactose contents of developed yoghurt from its original concentration were 74 and 42.5% in cow milk and goat milk, respectively. The use of glucose by bacteria were stable after about 2 h of incubation, while galactose formed started at 4 h incubation led to low quantity. Consumers had preferred the taste of Yoghurt after 8 h of incubation, and Yoghurt from cow milk was considered better than from goat milk.

(Key words: Yoghurt, Consumers acceptance, Carbohydrate contents).

## ANALISIS YOGHURT YANG DIKEMBANGKAN MENGGUNAKAN SUSU KAMBING DAN SAPI PADA MANAJEMEN PAKAN LOKAL DI SLEMAN

### INTISARI

Penduduk Indonesia hanya mengkonsumsi sangat sedikit susu dan produk susu. Hal itu disebabkan sebagian oleh masalah ketidaktahanan laktosa dan cita rasa asing dari produk susu. Susu fermentasi dikembangkan dan dimanfaatkan untuk mengatasi masalah itu. Yoghurt adalah salah satu produk fermentasi yang terkenal, bermanfaat untuk kesehatan konsumen, khususnya yang menderita *lactose intolerance*, seperti sebagian besar manusia Indonesia. Penelitian ini ditunjukan mengembangkan yoghurt dari susu sapi dan kambing dan diikuti bersamaan melihat daya terima rasa dari panelis terlatih (6). Hasilnya menunjukkan bahwa pengurangan kadar laktosa pada proses pembuatan yoghurt dari susu sapi dan kambing adalah berturut-turut 74 dan 42,5% dari kadar awalnya. Kadar glukosa yoghurt terbentuk relatif stabil mulai jam ke 2 inkubasi, sedang mulai jam ke 4 inkubasi galaktosa yoghurt yang terbentuk justru mulai berkurang dan dimanfaatkan oleh bakteri yoghurt. Uji cita rasa menunjukkan bahwa konsumen lebih menyukai rasa yoghurt setelah 8 jam inkubasi, dan yoghurt dari susu sapi lebih disukai konsumen.

(Kata kunci: Yoghurt, Daya terima konsumen, Kandungan gula).

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## Introduction

Yoghurt is a famous fermented milk that developed using *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*, originated from Balkan's regions and spread out around the world. Carbohydrate of raw milk is firstly attacked by  $\beta$ -galactosidase produced by the two bacteria reducing about 30 % of original lactose content and develop to final lactic acid concentration about 0.7-1.5 %. giving a light taste of acid and acting as a refreshing agent. This enzyme is very use for the population that suffer from lactose intolerance as Monggolit and Negrito' ethnics or their offspring like people living in Indonesian archipelago. Yoghurt as well as raw milk is an excellent source of calcium for the development of human corps, especially for women. Beside the positive role, faced to unacceptability of consumers that largely depended on its taste; such high quality fermented milk will become unusefull. Indonesian consumers which are considered close to the flavor of vegetable products rather than from animals. This research has been conducted to develop the yoghurt using from goat and cow that reared and fed using tropical grass, legumes and concentrates as local feed found in Sleman at Yogyakarta special region.

## Materials and methods

### Materials

Peranakan Ettawa Goat milk and PFH-cow milk were from Faculty's farm. While strain of Yoghurt bacteria was from INRA Jouy en Josas (France) collected from commercial sources.

This research was conducted on Faculty of Animal Science and on Laboratory of Organic Chemistry, Faculty of Mathematics and Natural Science, GMU, 1997.

## Methods

Yoghurt was developed as a mixed culture of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subs. *bulgaricus*. The Yoghurt culture was prepared by heating rawmilk at  $\pm 110^{\circ}\text{C}$  for 10 minutes. The mixed culture was cultivated (3% v/v) as the ratio between rod and cocci (1:1) at  $42^{\circ}\text{C}$ . The pH were detected each 2 hrs of incubation. The consumer's acceptability test had been conducted using six entrained panelists after 30 hrs-sessions of taste training, using five scale of intensity or score as modified to that of classic note (Kroll, 1990). The carbohydrate contents were detected by a high performance liquid chromatography (HPLC) using Aminex HPX-87 H column as Marsili et al. (1981), and Plaga et al (1989).

## Results and discussion

### The growth of bacteria

The results showed that the acidity of mixed-culture was higher than that of each single culture, reaching at least 0.52% for cow milk and 0.64% for goatmilk as equivalent to lactic acid/liter as in Figure 1. Despite of higher growth of Yoghurt than in single culture, as reviewed by Tamime and Deeth (1980), the growth of the culture in these experiments was considered low. The normal acidity of Yoghurt from cow milk was not less than 0,79%. While the acidity of Yoghurt from Peranakan Ettawa goat's milk was less than that from cow milk. The low acidity of Yoghurt from goat milk was due probably to the different composition of organic acid presents in fermented milk. There was not enough data concerning a normal acidity of yoghurt made from goat's milk, especially from goat reared at tropical condition.

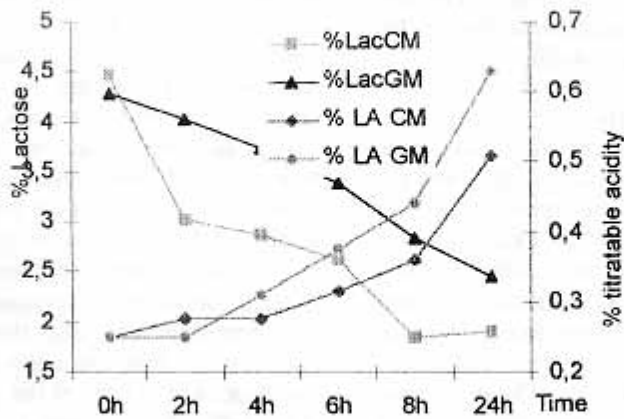


Figure 1. % lactase and % titratable acidity of yoghurt.

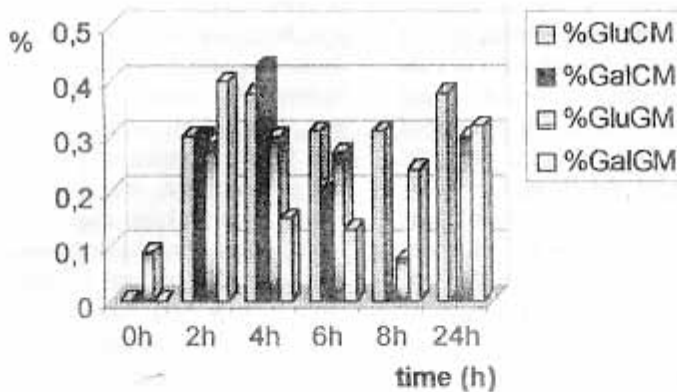


Figure 2. Percentage of monosaccharides released during processing of yoghurt.

**The change of carbohydrate contents**

The hydrolysis of lactose had released free glucose and galactose. Theoretically, glucose and galactose are produced in equal amounts. However, in practice this does not happen, because other sugars, oligosaccharides are formed in addition to glucose and galactose, and the preference of bacteria to

use monosaccharide liberated depended on the strain of bacteria. The reduction of lactose content in Yoghurt from cow milk was higher than that from goat milk by 74 and 42,5%, respectively (Figure 1 and 2). Yoghurt bacteria, *Streptococcus thermophilus*, and *Lactobacillus delbrueckii* subs. *bulgaricus* preferred normally glucose as the main

monosaccharide for their growth. Streptococci did not have the tendency to consume galactose, but lactobacilli did. The low contents of galactose in both Yoghurt, especially at 8-h incubation were due to the high consumption by lactobacilli.

#### **Consumers' acceptability**

The developed Yoghurt was then evaluated its taste by trained panelist and the observed taste and preference note of consumers for each type of basic taste of Yoghurt (sweetness, acidity, saltiness and bitterness) were at table I. Taste note of sweet intensity, as well as preference score, of Yoghurt from cow milk was considered greater than of from goat milk. The preference scores of sweetness in the two type of tended fermented milk were greater than those of sweet intensity. But, the consumers tent to prefer the product that more sweet, as Murti, (1995) indicated by which fermented cow milk with the score of sweetness greater than in fermented goat milk was more preferred. It was found that at 8 hours of incubation in cow milk if had the greatest score of sweet intensity and preference. While for fermented goat milk, happened at 6 hours. At this moment, the contents of galactose were very low, so the sweetness of products was attributed from the role of lactose and glucose.

Beside the sweetness, the acidity of product is important. Unflavored Yoghurt, by virtue of the lactic acid produced during fermentation, is predominantly sour. Acidity of product that is due to the presence of lactic acid and others (orotic, propionic, butyric, uric, formic, acetic, citric, pyruvic and hypuric) was originated from divers activities (Marsili, et al., 1981). For organic acids which are released from microbial activities as: lactic, formic, acetic or pyruvic acids are greatly depended on the health of the cells. There was a great possibility to find some injured cells or cells were still in dormant condition while thawing during preparation.

The intensity score of acidity of the two kind of milk reached maximum at 24 hours of incubation, although consumer preference had not presented at the same way. Furthermore, Murti (1995) had found that the preference of consumers on the taste of fermented product was influenced greatly by acidity and the acidity of products that was not more than 0,75% and was considered more acceptable than those of more than 1% (equivalent to lactic acid). For fermented cow milk, with the acidity of less than those of fermented goat milk, it is considered that the higher intensity of acid, the score of consumers preference. It had been considered also that the acceptance of consumers depended upon the ratio between sweetness and acidity of the products (Barnes et al., 1991). Ratio around 1 was considered as good (Murti, 1995)

Theoretically, as the acidity raised, due to the presence of lactic acid bacteria (LAB), milk is probably aggregated or coagulated. It is noted that when the acidity reached 4,5 – 4,6, fermentation of milk would cease and the mineral would release, as well as the hydrophobic amino acids. The released of the two components will cause the raise of salt and bitter intensity of products. Aggregation of protein that mark the first stage of coagulation perhaps could be interpreted also as the onset of some hydrophobic amino acids that normally present in the core of protein (free from water). Most of these hydrophobic amino acids presented some degree of bitterness (Murti, 1995) The saltiness of the two fermented milk was considered as slightly to moderate. For these conditions, consumers had been divided in their opinion, by which consumer preferences on Yoghurt from cow milk was higher than from goat milk along the time of incubation. More than 60% of consumers' preference notes were attributed to Yoghurt from cow milk. While only 47% for those from goat milk. It was also noted the same phenomenon in bitterness perception of consumers (intensity and preferences).

Table 1. Intensity note and preference score of tastes of Yoghurt from cow milk (CM) and goat milk (GM)<sup>a</sup>

Type of Milk	Taste	Intensity or Preference	Time of incubation (h)						
			0	2	4	6	8	24	
CM	sweet	Intensity	2	1.86	1.86	2	2.14	1.86	
		Preference	2.43	2.57	2.43	2.43	2.71	2.43	
	acid	Intensity	1.43	1.57	1.86	1.86	1.71	2.14	
		Preference	2.43	2.28	2.28	2.43	2.43	2.14	
	Salt	Intensity	1.71	1.57	1.71	1.57	1.71	2.28	
		Preference	2.57	2.71	2.71	2.71	2.71	2.43	
	Bitter	Intensity	0.43	0.71	0.57	0.71	0.71	1.14	
		Preference	2.86	2.57	2.43	2.43	2.43	1.86	
	GM	Sweet	Intensity	1.28	1.14	1.71	1.86	1.86	1.57
			Preference	1.86	2.1	2.14	2.14	2	1.57
Acid		Intensity	1.43	1.43	2	2.28	2.57	3.14	
		Preference	1.71	2	2	1.86	1.86	1.86	
Salt		Intensity	1.57	1.57	1.71	1.86	1.71	2.14	
		Preference	1.71	1.86	1.86	1.86	1.86	1.86	
Bitter		Intensity	1	1.14	1.28	1.57	1.57	1.71	
		Preference	1.43	1.57	1.71	1.71	1.57	1.57	

<sup>a</sup>Maximum score is 4 (5 scale of intensity/preference),

CM=Cowmilk, GM=Goatmilk

The perception of flavor is the results of complete perception of sensory signals that initiate from the periphery and terminal in the central nervous system (Brand and Bryant, 1994). The quantity of flavor sensation is therefore, seen as a complex function of multiple interaction (the stimuli may react with more than a single receptor system), all integrated. When the liquid of milk passed into the mouth and the tongue, firstly it would be detected by consumers on its sweetness, then followed by the sense of saltiness, sourness, and finally bitterness. It seemed that the consumers' perception on saltiness, sourness and bitterness was influenced partly by the sense of sweetness. So, there was not surprised that the consumers' perception on fermented products was greatly influenced by sweetness perception, as indicated. Between the two components of flavor, i.e. taste and odor, it has been proved that the sense of consumer

preference was more influenced by the taste of fermented milk than from the odor, in which the degree of likeness was in positive correlation to consumer acceptance (Murti, 1995).

### Conclusion

The more acid the fermented milk the less accepted by consumers. Consumers preferred Yoghurt from both milk after eight hrs of incubation and Yoghurt from cow milk was better accepted by trained panelists.

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