



## Analytical Methods

# The oxidative and lipolytic stability of Yayık butter produced from different species of mammals milk (cow, sheep, goat) yoghurt

Ebru Şenel\*, Metin Atamer, F. Şebnem Öztekin

Department of Dairy Technology, Faculty of Agriculture, Ankara University, 06110 Ankara, Turkey

## ARTICLE INFO

## Article history:

Received 9 June 2010

Received in revised form 11 December 2010

Accepted 1 January 2011

Available online 9 January 2011

## Keywords:

Yayık butter

Free fatty acids

Peroxide value

Goat milk

Sheep milk

Cow milk

## ABSTRACT

Yayık butter, made from yoghurt, is one of the traditional dairy products in Anatolia. In this study, some properties of Yayık butter produced from cow, sheep, and goat yoghurts have been observed during 30 days of storage at 4–5 °C. In this purpose yoghurts were produced from different species milks then these yoghurts were used as a raw material for production of Yayık butters samples. On the first day of the storage, differences in pH of serum among the butter produced from different mammals were statistically significant. The highest value of lactic acid was measured in the sample of sheep butter (SB). The level of lactic acid in Yayık butters was significantly different. Goat butter (GB) had weaker oxidative stability and significantly higher peroxide value than those of other samples. The highest accumulation of the free fatty acids has been detected in sample GB. All samples of Yayık butter received almost the same score on the first day of the storage, but on day 30 some flavour defects in sample GB were noted by the panelists.

© 2011 Elsevier Ltd. All rights reserved.

## 1. Introduction

Using the yoghurt as a raw material for butter production could be considered an authentic procedure specific to Anatolia. Butter produced from yoghurt is referred to as “Yayık” butter in Anatolia. The first record of butter dates back to the Chalcolithic Age. Approximately 7500-year-old potsherds of a special type of jar called a “churn” were found in the excavations at Yarikkaya/Hattuşaş in central Anatolia (Sauter, Puchinger, & Schoop, 2003). The popularity of traditional dairy products has shown a steady increase in recent years, since two approaches – protected geographical indication (PGI), protected designation of origin (PDO) – have become an important issue for the registration of traditional dairy products in European Committee (Avşar, Kılıç, Yüceer & Atay-Avşar, 2003).

There have been some studies of Yayık butter in the last 5–6 years. In these studies some properties (physicochemical, sensorial) (Hayalaoglu & Konar, 2001; Sagdic, Dönmez & Demirci, 2004), fatty acids profiles (Sagdic et al., 2004), carbonyl compounds of Yayık butter (Atamer, Gürsoy, Öztekin, & Şenel, 2004) or isolation and identification of lactic acid bacteria (LAB) to select the best LAB combination of butter production (Sagdic, Arıcı & Şimşek,

2002) have been investigated by researchers. In addition, the conventional way of manufacturing Yayık butter was observed at six different small farms and some technological parameters were monitored throughout the processing period from yoghurt to final product (Atamer, Şenel, & Öztekin, 2004). Generally, the typical characteristics of dairy products are governed by many factors, but the type of milk used as a raw component in the process is, arguably, the most important parameter having a determining effect on the properties of dairy products. There is only one study on Yayık butter made from cow's, sheep's or goat's yoghurt. In this study, especially some milk fat constant (Reichert-Meissl, Iodine value, etc.), fatty acids profiles, microbiological characteristics have been determined in Yayık butter samples (Sagdic et al., 2004).

In summary, the objective of this study is to determine oxidative and lipolytic stability of Yayık butter when different types of the milk/yoghurt are used for the production. For this purpose, some properties such as peroxide value, free fatty acid composition, lactic acid etc. and their effects on the lipolytic and oxidative stability along with their changes during the storage have been examined.

## 2. Materials and methods

### 2.1. Materials

Raw milks (cow', sheep', goat') was obtained from Balikesir province farms on the north-west region of Turkey. *Streptococcus*

Abbreviations: CY, yoghurt produced from cow's milk; SY, yoghurt produced from sheep's milk; GY, yoghurt produced from goat's milk; CYB, butter produced from cow's yoghurt; SYB, butter produced from sheep's yoghurt; GYB, butter produced from goat's yoghurt.

\* Corresponding author. Tel.: +90 312 5961300; fax: +90 312 3182219.

E-mail address: [senel@agri.ankara.edu.tr](mailto:senel@agri.ankara.edu.tr) (E. Şenel).

*salivarius* subsp. *thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* (TM081, EZAL Rhodia, France) as were used as yoghurt starter cultures.

## 2.2. Methods

### 2.2.1. Yayık butters production

The steps in the production of Yayık butter are given in Fig. 1. It is briefly summarised below. First, yoghurt samples were produced for use as the raw material in the production of Yayık butters. The raw milks (cow, goat, sheep), which possess initial composition unchanged, were used for the production of yoghurts.

Raw milks were not standardised in terms of fat and dry matter contents. All milks were pasteurised at 85 °C/15 min and then cooled to 45 °C. The starter culture was added to milk at 2% (w/w) ratio and incubated at 43–45 °C. Incubation was ended at around pH 4.6–4.7. All yoghurts were cooled to 10–15 °C. Then yoghurts were kept at 4–5 °C for 12–14 h to form the crystalline of milk fat.

Yayık butters were produced according to the method described by Atamer, Şenel, and Öztekin (2007). Following the production of yoghurt samples a sufficient amount of hot water was added to obtain the desired yoghurt:water ratio (1:1), and churning temperature (17–18 °C). Churning took place for 15–20 min. At the end of the churning period, buttermilk (Yayık ayranı) was separated and butter grains were washed with cold water (7–9 °C) two times to remove residual buttermilk. The granules were kneaded and each portion of butter samples (300 g) was packed with polyamide/polyethylene material under vacuum and refrigerated at 4 °C. Yayık butter samples were analysed on 1st and 30th day of storage. Yoghurts as raw material were also analysed. Yayık butters production were carried three replication.

### 2.2.2. Chemical analysis

The fat content of yoghurts was determined by the Gerber method (Hooi, Barbano, Bradley, Budde, Bulthaus, Chettiar et al., 2004). The dry matter of the yoghurts and butter samples were determined by oven drying method according to the methods used by Hooi et al., 2004. The pH values were measured by using a pH-meter model Mettler Toledo (Analytical, Sonnenbergstrasse 74, CH-8603, Schwerzenback, Switzerland) fitted with a standard, combined glass electrode. pHs in serum of butter samples were determined according to IDF (1981). Lactic acid value of yoghurt and butter samples were measured using the spectrometric method (Steinholt & Calbert, 1960).

### 2.2.3. Determination of Peroxide value

The extraction of fat from butters were performed according to AOAC (2000). Weighed butter samples of around 100 g were melted in water bath at 40–50 °C until H<sub>2</sub>O and curd separate completely. Clear supernatant was filtered by filter paper. Peroxide value of fats extracted from butter samples were determined by spectrometric method described by Downey (1975).

### 2.2.4. Determination of free fatty acids

Sample preparation: samples were weighted as 2.5 g for yoghurt and as 1.5 g for butters. It was ground with 2.5 g of Na<sub>2</sub>SO<sub>4</sub> and then, 5 mL of internal standard (C<sub>7</sub>) and 300 µL H<sub>2</sub>SO<sub>4</sub> were added. The mixture was mixed thoroughly for 1 min and hexane (5 mL) was added. Samples were rested for 1 h before the liquid phase was extracted from Biorad column with deactivated alumina. Each sample was eluted two times in each column. Then each column was washed with 5 mL hexane/diethyl ether (1:1) two times and dried with 5 psi of air. Dried alumina containing free fatty acids was transferred to test tube and 2 mL of 6% formic acid in ether added. The mixture was centrifuged at 2000g for 10 min.

The clear part was transferred to vials by Pasteur pipette and stored at –18 °C until the injection.

Free fatty acids in butters were analysed by a GC system (Agilent 6890 series, Agilent Tech. Inc., CA, USA) according to the method of Deeth, Fitz-Gerald, and Snow (1983) Operating conditions for GC were as follows; Detector: FID (Agilent Tech. Inc., CA, USA) at 260 °C, Column: Capillary (30 m × 320 µm id. With 0.25 µm film thickness (HP-FFAP Agilent Tech. Inc., Model 19091F-433), Injection mode/volume: Split (1/10) 5 µL at 250 °C, Flow rates: H<sub>2</sub>:Air:-N<sub>2</sub> = 33:370:30 ml min<sup>-1</sup>. Oven temperature: 120 °C for 0 min increased to 200 °C at a rate of 10 °C min<sup>-1</sup> then held at 200 °C for 2 min and increased to 205 °C at a rate of 10 °C min<sup>-1</sup> and held for 2 min, then increased to 210 °C at a rate of 10 °C min<sup>-1</sup> and held for 2 min then increased to 215 °C at a rate of 10 °C min<sup>-1</sup> and held for 3 min and increased to 230 °C at a rate of 10 °C min<sup>-1</sup> held for 3 min. Standard mix solutions were prepared in 6% (v/v) formic acid in ether solution likewise in sample preparation and 5 µL injected into GC system with the same conditions as sample injection. FFAs standards were chromatographic grade supplied by Agilent (Agilent Tech. Inc., CA, USA). Quantification of the constituents was achieved by means of either external or internal standard mode.

### 2.2.5. Sensory evaluation

The method for cream butter recommended by Tobias (1976) was used for sensory evaluation. The scale of evaluation modified by Şenel (2006) for Yayık butters is listed Table 1. Panel consisted of experienced ten panelists (five female and five male) from the academic staff working in the Dairy Department. Panel evaluated butters in terms of flavour and aroma, colour and appearance, texture and body properties during storage, using a 90 point scale according to spectrum method for descriptive analysis. Fifty percent of panelist's ages ranged from 45–55, twenty percent of ranged from 40–45 and thirty percent of ranged from 25–35 years old. The panel was trained 1 h before each evaluation session. Some sensory terms for flavour-aroma and texture of Yayık butter introduced to panelists. Samples were served with a glass of water and an unsalted cracker to the panelists after they were left at the room temperature for 10 min. Samples were presented in 3 digit coded glass plates. Cow's, sheep's and goat's butter samples were presented at the same time in each session. Sensory evaluation of samples in each analysis period was carried out two times.

### 2.2.6. Statistical analysis

Firstly, Kolmogorov-Smirnov test was applied to the whole data if they show normal distribution or not. The data having normal distribution were analysed by variance analysis. Differences between means of the Yayık butter samples were controlled using the Duncan's Multiple Range test (Rosner, 2006). For some data (sensory results) did not fulfill the requirements for variance analysis, Kruskal-wallis (non parametric test) were applied. To compare the differences between storage days in sensory results, Mann-Whitney-U was used. All experiments were carried out with three replications. Minitab 13.0 for Windows statistic package was used for statistical analyses.

## 3. Results and discussion

### 3.1. Yoghurt compositions

Some properties of yoghurts used as a raw material for the production of Yayık butter are presented in Tables 2 and 3. Since standardisation of yoghurt milk is not a common practice in the conventional way of manufacturing Yayık butter, standardisation has not been applied to yoghurt milk in this study. Consequently,

Download English Version:

<https://daneshyari.com/en/article/10542525>

Download Persian Version:

<https://daneshyari.com/article/10542525>

[Daneshyari.com](https://daneshyari.com)