



## Probiotic butter: Stability, free fatty acid composition and some quality parameters during refrigerated storage



Tuba Erkaya<sup>a</sup>, Bayram Ürkek<sup>b,\*</sup>, Ünsal Doğru<sup>c</sup>, Bülent Çetin<sup>d</sup>, Mustafa Şengül<sup>d</sup>

<sup>a</sup> Department of Food Processing, Erzurum Vocational High School, Ataturk University, Erzurum, Turkey

<sup>b</sup> Siran Mustafa Beyaz Vocational High School, Gumushane University, Gumushane, Turkey

<sup>c</sup> Department of Animal Sciences, College of Agriculture, Ataturk University, Erzurum, Turkey

<sup>d</sup> Department of Food Engineering, College of Agriculture, Ataturk University, Erzurum, Turkey

### ARTICLE INFO

#### Article history:

Received 12 November 2014

Received in revised form

28 April 2015

Accepted 29 April 2015

Available online 19 May 2015

### ABSTRACT

This study was carried out to determine whether butter can be a carrier for probiotics by observing the survivability of selected probiotic strains during cold storage. The effects of using probiotic adjunct cultures (*Lactobacillus acidophilus* ATCC 4356 and *Bifidobacterium bifidum* ATCC 29521) in butter on microbiological counts, sensory characteristics, chemical characteristics and free fatty acid (FFA) composition during storage for 60 days were investigated. The butter samples produced with *B. bifidum* ATCC 29521 maintained the probiotic characteristics, in that the level of viable cells of the probiotic was  $>10^6$  cfu g<sup>-1</sup> until 30 days of storage. The highest scores in sensory assessment were obtained on the first day of storage. FFAs, including C2:0, C6:0, C14:0 and C18:1, were affected significantly by storage period and by the adjunct cultures, however conjugated linoleic acid and C18:2 were not affected by storage period and the use of probiotic adjunct culture.

© 2015 Elsevier Ltd. All rights reserved.

### 1. Introduction

Probiotic organisms have been generally consumed with fermented foods for thousands of years (Ranadheera, Baines, & Adams, 2010). These consist of viable microorganisms that beneficially affect health of the host by improving microbial balance in the gastrointestinal tract. Probiotic foods are accepted as functional foods (Kaur & Satyanarayana, 2004). Fermented dairy products have been used as functional probiotic foods since ancient times and this situation continues. These foods have therapeutic properties such as prevention of diarrhoea, cancer and childhood infections, inhibition of *Helicobacter pylori*, prevention of constipation, and improving lactose digestion (Sánchez, Reyes-Gavilán Margolles, & Guemond, 2009). Probiotic strains of *Lactobacillus* and *Bifidobacterium* are used in many foods due to beneficial health effects. Usage of these strains in fermented dairy products has become widespread (Dave & Shah, 1997; Laine, Salminen, Benno, & Quwehand, 2003; Shah & Lankaputhra, 1997). Probiotic bacteria in dairy products have characteristics such as the

preservation of dairy products, the production of antimicrobial and flavour compounds, and the raising of the nutritional value of food (Parvez, Malik, Ah Kang, & Kim, 2006).

There are many studies reporting on the use of probiotic bacteria in the production of dairy products such as yoghurt, cheese, and ice cream (Gomes et al. 2011; Ranadheera, Evans, Adams, & Baines, 2013; Sagdic, Ozturk, Cankurt, & Tornuk, 2012; Salam et al., 2011; Soukoulis, Lyroni, & Tzia, 2010). Recently, there have been studies on the utilisation of probiotic bacteria in butter production. In these studies, it has been reported that probiotic properties of the bacteria are important. Probiotic bacteria (*Lactobacillus maltaramicus* AC 3–16 and *Lactobacillus casei* subsp. *casei* AB16–65) causes a reduction in the cholesterol content on a fat basis (Aloğlu & Öner, 2006). However, research about the utilisation of *Bifidobacterium bifidum* and *Lactobacillus acidophilus* in butter production has not been encountered in the literature.

Butter has been produced in Turkey for centuries (Sagdiç, Dönmez, & Demirci, 2004); however, consumption has decreased due to the perceived negative effect on human health of saturated fatty acids (Oeffner et al., 2013). Despite this, milk fat contains essential fatty acids needed in the human diet. Lipid-soluble vitamins such as retinol, carotenoids and tocopherols also function as antioxidants that are important for human health. Physical,

\* Corresponding author. Tel.: +90 456 2331032 3606.

E-mail address: bayramurkek@gumushane.edu.tr (B. Ürkek).