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ORIGINAL PAPER

The Production of an Experimental Table Margarine Enriched with Conjugated Linoleic Acid (CLA): Physical Properties

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Abstract Even though conjugated linoleic acid (CLA) is known to have some beneficial effects on the human body, its consumption has decreased over the past 20 years due to the replacement of animal fats by vegetable oils. In this study, using the structured lipid (SL) containing CLA, an experimental table margarine enriched with CLA was produced and stored for 3 months at two temperatures prior to performing the relevant analyses. The GC results showed that the margarine fat had 10.6% CLA. The solid fat content was the highest in week 0 in all samples, which then decreased during storage but the hardness increased. An increment in dropping point was also observed in the samples. In week 0, all the samples had the β' crystal as the predominant crystal form but a crystal transformation from β' to β was observed during storage.

Keywords Conjugated linoleic acid (CLA) · Table margarine · Physical properties

Introduction

Conjugated linoleic acid (CLA) is a mixture of various isomers of octadecadienoic acid with double bonds at conjugated positions. The two important forms of CLA, the *cis*9, *trans*11 and *trans*10, *cis*12 isomers, are naturally found in milk fat and meat from ruminants. CLA is known to exert beneficial effects such as inhibiting tumor growth, reducing body fat, and reducing atherosclerotic risks [1, 2].

Commercial vegetable oils contain only small amounts of CLA (0.1–0.5 mg/g fat), which is due to the oil refining and hydrogenation processes [3]. Even though the beneficial effects of CLA have been revealed, the consumption of dietary CLA has decreased during the past 20 years due to the replacement of animal fats by vegetable oils. It is suggested that relatively low amounts of CLA (3.5 g/d for a 70-kg person) in human diet would have an anticarcinogenic effect [4]; many studies have been conducted on the production of modified oil and fat (structured lipid, SL) containing CLA, especially by an enzymatic reaction [4, 5]. However, to the best of our knowledge, there are still no reports on the production of food products enriched with CLA.

Margarine, namely table, bakery, and puff pastry, is a water-in-oil (W/O) emulsion food product that must contain at least 80% fat [6, 7]. Table margarine is of two main types: soft and stick. Soft margarines should be spreadable at refrigerator temperature but not oil off when left at room temperature for a short period of time, whereas stick margarine should be spreadable at 15 °C [8, 9]. The production of margarine fats is usually carried out by partial hydrogenation which causes the formation of a high content of *trans*-fatty acids (TFAs) as high as 50% during the process; therefore, the trend nowadays is to produce *trans*-free products by using hard stocks such as palm stearin or fully hydrogenated fats [10–12]. Moreover, there is a great interest in incorporating as much liquid oil as possible into the margarines to claim the highest possible amount of polyunsaturated or monounsaturated fatty acids following nutritional recommendations [8].

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