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Determination of sodium stearoyl lactylates in foods using HPLC after derivatization with 2-nitrophenyl hydrazine

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Abstract

A high-performance liquid chromatographic method, following saponification and derivatization with 2-nitrophenyl hydrazine, was developed for determination of lactic acid derived from sodium stearoyl lactylates (SSL) in processed foods. Recoveries of SSL from ten kinds of processed foods spiked with SSL (2 g/kg) ranged from 79 to 102%, while the error associated with repeatability and intermediate reproducibility was less than 6.8% and 7.2%, respectively. This study showed that the proposed method can be applied for analysis of SSL in processed foods. The method is useful and reliable.

Keywords : sodium stearoyl lactylate, derivatization, 2-nitrophenylhydrazine, food, HPLC

I Introduction

Sodium stearoyl lactylate (SSL) and calcium stearoyl lactylate (CSL) are used worldwide as emulsifiers for the facilitation of food and beverage processing. The latter has been designated as a food additive in 1964. The Minister of Health, Labour and Welfare of Japan (MHLW) approved SSL as a food additive in 2010[1]. The standards for use of SSL in processed foods are also established by the MHLW. The permitted levels of use of SSL are defined as CSL. The levels are 8.0 g/kg in mixed-powder for sponge cakes, butter cakes and steamed breads; 5.5 g/kg in butter cakes, sponge cakes and steamed bread; 4.5 g/kg in noodles (raw noodles and instant noodles, excluding other dry noodles); 4.0 g/kg in bread, confections and macaroni; 2.0 g/kg in steamed bean-jam bun (manjyu).

To date, a number of methods have been developed to identify SSL in foods. Regula *et al.* showed that SSL is a mixture of various components using TLC with visualization by bromocresol green spray[2]. A qualitative analytical method for SSL and CSL using HPLC with off-line mass spectrometry was reported by Sudraud *et al*[3]. A semi-quantitative analytical method for SSL determination in wheat flour using TLC was developed by Wheeler[4]. Yukawa and Hanada reported a GC derivatization method for determining CSL in bread[5]. However, this method requires the purified SSL standards, which must be prepared by chemical synthesis. SSL standards are not commercially available. Meanwhile, the MHLW had announced a reference method (a now-defunct method) for CSL determination in bread and confections[6]. In this method, stearoyl lactylate is extracted from food and subjected to saponification to obtain lactic acid, which is then analyzed using enzymatic methods. However, the disadvantages of this method are that they are time-consuming and using a large amount of hazardous organic solvents such as chloroform. Therefore, it is necessary to develop an efficient method for the determination of SSL in processed foods.

Recently, we investigated the components of commercial SSL products in Japanese manufacture using thin layer chromatography (TLC) and liquid chromatography with mass spectroscopy (LC-MS). Sodium stearoyl-2-lactylate is the major component of commercial SSL products (Fig. 1).

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