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THE THRESHOLD EMBEDDING ESSENTIAL FATTY ACIDS IN FRESH SPUN PASTE CHEESE

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Abstract

Milk fat has an outer membrane lipoprotein protection is cleaves at 70 ° C and 200 bar . The fat in fish oil adheres to the milk fat globule membrane and fat recover using milk protein composition . In order to enrich spun paste cheese with essential fatty acids that occurred from sheep with progressive addition of fish oil 0% ; 0.05 % ; 0.10 % ; 0.15 % fish oil added . Year were taken considering three essential fatty acids : linoleic acid ; linolenic and γ - linolenic acid , which both are representative for the milk fat and for the fish oil. As a result of the analysis were obtained the following concentrations of fish oil to be added to the milk ll enclosing the threshold of the three essential fatty acids in milk fat globule sheep : 0.3773 % linoleic acid ; 0.3970 % linolenic acid ; γ - linolenic acid 0.7694 For the process recommended values lower than the theoretical ones .

Key words: fat globule milk fish oil

INTRODUCTION

Sheep milk is used extensively in human nutrition because of the great taste compared to the products of the goat milk and that can be easily digested by the body. Fat cells have a diameter of 2-3 times lower than in cows' milk , is thus separated from the surface more difficult and are more easily assimilated by the body. Sheep 's milk is considered healthy because of the high content of orotic acid . Orotic acid compounds have antitumor activity (Butour et al , 1997). Orotic acid is associated with potential liver cell recovery and prevention of liver lipolytic effect . The orotic acid has a role in reducing body fat (Versiani et al , 2008). It is known that sheep milk is not only important for the metabolism of the liver but also to cover the manganese . It is known that people who practice pastoralism in several regions of the world have a higher life expectancy (Hanreich et al , 2008). Biological functions of essential fatty acids are important in humans : role of vitamins they participate in the formation of cell membranes , are precursors of prostaglandins , reduce blood pressure levels are protective and liver cells , reduce blood glucose (Banning et al , 2005 , Connor et al , 2000; Simopoulos et al , 1991) . Dietary recommendations suggest the need to increase consumption of polyunsaturated fatty acids (PUFA). European Academy of Nutrition Sciences (EANS) , the Department of Health of the

United Kingdom (1994) recommends a minimum intake of 0.2 g ω -3 LC PUFA (polyunsaturated long chain fatty acids) , EPA and DHA , for a person / day (Ruxton, Reed , Millington Simpson , 2004; Tautwein , 2001)

MATERIALS AND METHODS

Three samples were obtained from sheep's milk spun cheese with added fish oil 0 %; 0.05 % and 0.15 %. Fish oil has been incorporated into the molecule of fat by homogenization. Fresh spun paste cheese was analyzed in terms of sensoryby unauthorized five people. Physicochemical was intended to determine acidity with titratable method and percentage of fat was performed by the Gerber method. In terms of the evolution of the concentration of fatty acids were determined 19 sheep milk fatty acids and also examined the following fish oil fatty acids representative of sheep milk, fish oil and product obtained.

Gas chromatographic analysis of fatty acid in 1 g of sample was milled first in 10 ml of distilled water and then added 0.6% ammonia solution, 2 ml of ethanol, 4 ml ethyl ether and 4 ml. hexane, after which the mixture was stirred for 3 minutes. After that the lower layer has been removed ammonia and the mixture was filtered through a cellulose filter, and sodium sulfate (Na2SO4) and dried. he fatty acids were converted to methyl esters by reaction with boron trifluoride / methanol at 80 ° C for two hours in a closed tube of Pyrex glass. The fatty acids were converted to methyl esters by reaction with boron trifluoride / methanol at 80 ° C for two hours in a closed tube of Pyrex glass. Extraction of methyl esters was performed using 10 ml of hexane. Hexane fractions collected were dried using anhydrous sodium sulfate, filtered, concentrated under a stream of nitrogen and finally taken up in 1 ml of hexane. Analysis of fatty acid methyl esters was performed using a gas chromatograph Shimadzu GC-17A equipped with a Chrompack capillary column with a length of 25 m and a diameter of 0.25 mm, stationary phase (a derivative of polyethylene glycol) being deposited inside the column in the form of a thin film of 0.2 μm. Was used detector was used and the mobile phase was 99.9% pure helium.

Methods Statistical analysis: for multiple comparisons were used testeleTukey, Duncan and Fisher and for comparisons with the control using Dunnett test. To determine the optimum concentrations of fish oil that are incorporates in fat globule to fololosit statistical analysis of the comparison method ROC curves, Receiver Operator Characteristic, (Teuşdea A, et al, 2008; Teusdea A, 2009).

RESULTS AND DISCUSSION

To determine the optimal dose of fish oil in terms of sensory and technological, have experienced two concentrations of added fish oil: 0.05%; 0.15%. Were produced and analyzed three variants of cheese 2 with the addition of fish oil compared with a probe made from sheep's milk without the addition of fish oil. Samples were coded according to Table 1.

Table 1

Codification of samples of spun paste cheese from sheep's milk rich in essential fatty acids

Addition of fish oil %	sample	
	Raw sheep milk	Fresh spun paste cheese
control sample with no fish oil	LC_0	Cp_0
0,05	$LC_{0,05}$	$Cp_{0,05}$
0,15	$LC_{0,15}$	$Cp_{0,15}$

After the point of view fresh sense spun paste cheese with no change in the appearance and consistency of the addition of fish oil in sheep milk. Fish oil prints spun cheese fresh taste and aroma of fish whose intensity increases with added fish oil cuncentraţia so: the addition of 0.05% is easily discernible at 0.15% addition is emphasized. This inconvenience may be removed by deodorizing the milk or cheese ripening.

Physico-chemical characteristics do not change in samples with added fish oil compared to control samples without added.

If overlapping chromatograms in the detection zone of fatty acids analyzed, it is observed that they fall between the concentrations of fish oil and milk (figure 1).

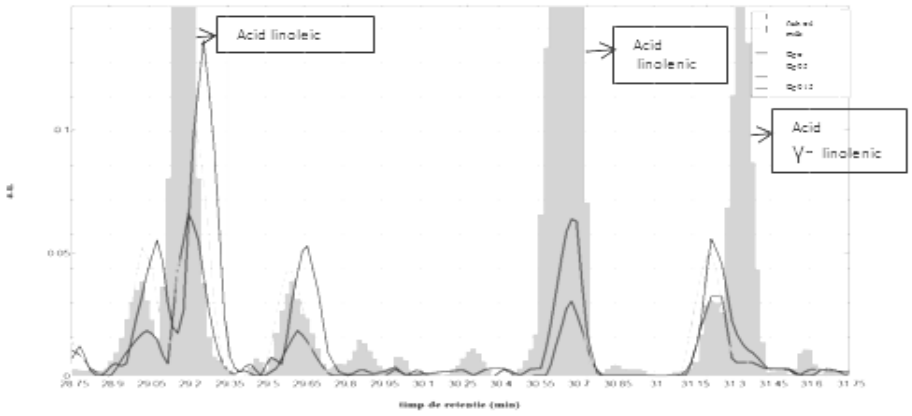

Figure 1 Overlapping chromatograms of milk with no added fish oil, cheese samples fot the fresh spun paste cheese and fish oil in the detection zone of essential fatty acids studied

The analysis of the enclosing threshold linoleic acid in fresh spun paste cheese in noted that it is theoretically 0.37% (table 2, figure 2).

Table 2

Values of embedding threshold for linoleic acid in the fresh spun paste cheese

Precision	Saturation threshold (from regression)	Saturation threshold (the derivative regression)	Saturation threshold (theory)
0.0001	2.905658864	2.905682445	0.377327296

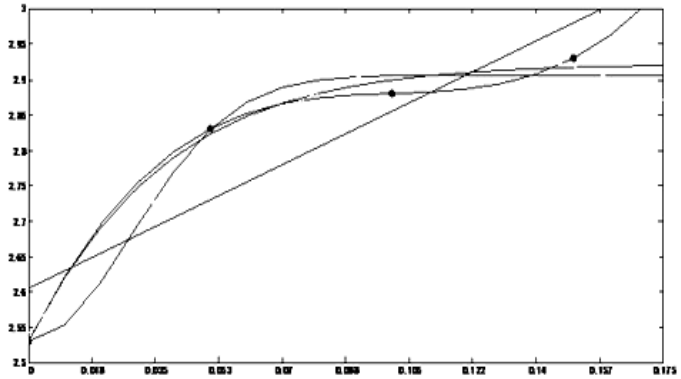

Figure 2 The threshold of linoleic acid incorporation in fresh spun paste cheese

For optimum limit linolenic acid concentration of fish oil is 0,39% theoretical about (Table 3, Figure 3).

Table 3

Threshold values linolenic acid embedding in the fresh spun paste cheese

Precision	Saturation threshold (from regression)	Saturation threshold (the derivative regression)	Saturation threshold (theory)
0.0001	1.140634108	1.140680292	0.396985987

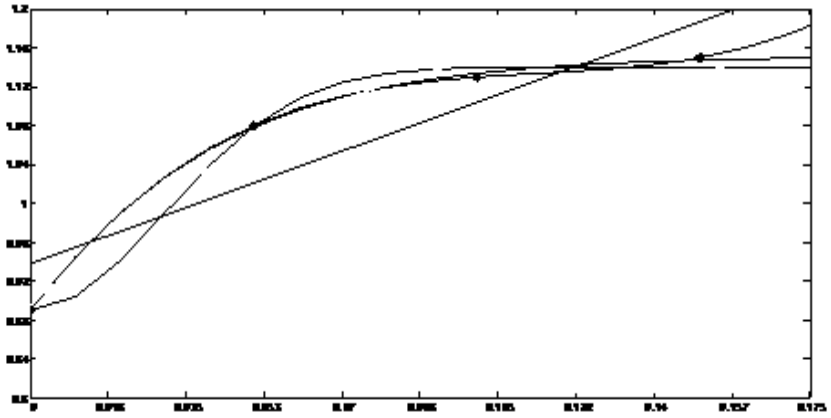

Figure 3 The threshold of linolenic acid incorporation in fresh spun paste cheese

In the case of γ-linolenic acid, the optimum concentration limits of fish oil is added to milk is about 0.76% theory (Table 4, Figure 4).

Table 4

Threshold values γ- linolenic acid embedding in the fresh spun paste cheese

Precision	Saturation threshold (from regression)	Saturation threshold (the derivative regression)	Saturation threshold (theory)
0.0001	1.063494056	1.063624847	0.769372533

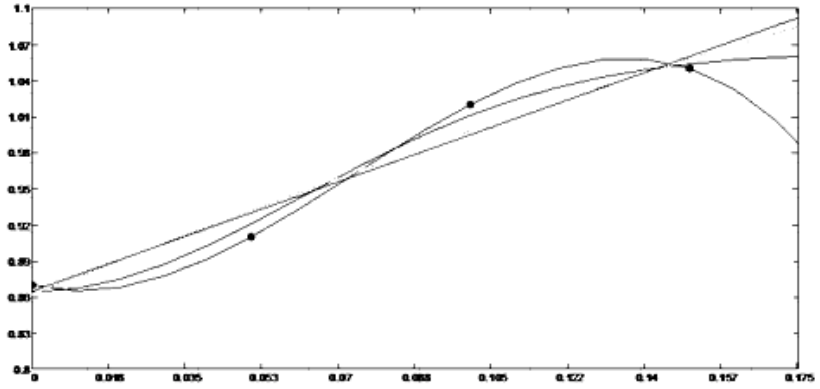

Figure 4 The threshold of γ- linolenic acid incorporation in fresh spun paste cheese

CONCLUSIONS

To obtain fresh spun paste cheese enriched in essential fatty acids, the role of functional, product by adding fish oil in milk is recommended in addition technologically up to 0.15%.

Although the limit of incorporation of the three essential fatty acids ranges from 0.3 ÷ 0.7% for technological purposes it is recommended to lower the addition of up to 0.15% as the influence on taste and flavor and in view of the fact that fresh cheese with spun paste is used in certain food preparations.

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