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COMPARISON BETWEEN THE MAXIMUM DEGREE OF INCORPORATION OF ESSENTIAL FATTY ACIDS IN THE SANE COMPARED TO FRESH TELEME CHEESE

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Abstract

In order to obtain functional dairy products, we tried to obtain acid dairy products and cheeses enriched in essential fatty acids. For this has been added in the sheep milk raw fish oil. The homogenization of the mixture was followed by the incorporation of the essential fatty acids from the fish oil into the milk fat globule. For manufacturing, it was chosen from the class of acid dairy products to obtain the sane and from the cheese class to obtain telemea cheese . The concentration of added fish oil in milk was ,.05%; 0,10%; 0,15%. The classic manufacturing technology was used in the manufacturing regime.

The products were analyzed from a sensory point of view and after two days after the manufacture the disappearance of the taste and aroma of the fish was detected in all the samples. Three essential fatty acids that are present in both sheep's milk and fish oil were taken into consideration. In sane proportion, linoleic acid increased from 2,68% to 3,24%; of linolenic acid from 1% to 1,3% and γ-linolenic acid from 0,84% to 1,21%. In teleme cheese, the proportion of linoleic acid increased from 2,58% to 2,82%; of linolenic acid from 0,31% to 1,09% and γ-linolenic acid from 0,85% to 0,99%.

The maximum limit of incorporation of the three essential fatty acids was reached in the case of sane for linoleic acid was not reached, for linolenic acid at 0,6055 added fish oil and for γ-linolenic acid at 1,3200%. In the case of teleme cheese, the maximum incorporation limit was reached for the three essential fatty acids at the following concentrations of fish oil added to the raw material milk: for linoleic acid of 0,1600%, linolenic acid of one, 0,1716% and for acid γ –linolenic of 0,4668%.

Key words: lactation products, fish oil

INTRODUCTION

Milk and dairy products are indispensable foods for life. They contain all the components and in optimal proportions that favor the normal functioning of the human body.

Milk casein is a protein that enters the structure of the clot in cheese manufacture. β-casein is part of the casein case and has the beneficial effect of regulating metabolic and physiological processes together with serum proteins. It also improves immune balance compared to a food that contains only whey protein (N. Rafiee-Tari,2019).

The digestion of milk components takes place gradually in the gastrointestinal tract. Most of the protein decomposition in cheese (75%) occurs in the intestinal digestion phase. The release of fat from cheese occurs mostly in the gastric and intestinal digestion stages, and the fat globules have become more spherical after the gastric phase. Proteolysis was produced for the gastric and intestinal phases (Kristīne Žolnere, 2019).

Food preservation technology can be achieved by adding "positive" bacteria to inhibit the growth of unwanted microorganisms. The results suggest that bacteriocin production of L. plantarum and L. casei lactic bacteria is an effective conservation strategy (Jianpeng Li,, 2019).

Phenylactic acid is a natural antibacterial compound resulting from the phenylalanine catabolism. It is metabolized with lactic acid and metabolized by glycolytic enzyme, lactate dehydrogenase, during fermentation. The addition of Lactobacillus plantarum improved the production of phenylactic acid by 1,7 times. Lactobacillus brevis and Leuconostoc lactis have determined an increase of about 1,5 times. These results suggested that the addition of specific lactic acid bacteria from starter cultures may increase the content of phenylactic acid and has the effect of increasing food preservability (Sera Jung, 2019).

Supplementing with fatty acids rich in oleic acid from the diet of dairy cows is a way to reduce the supply of saturated fatty acids from milk. This fact also improves the quality of dairy products (butter, cheese) which become creamier and are accepted by consumers. (Oonagh Markey, 2019).

Due to the use of oils rich in unsaturated fatty acids increase the whiteness of the product due to light reflection (Morna Anamaria, 2018).

Essential fatty acids play many important roles in human biology. Essential fatty acids ω-3 and ω-6 are the precursors of eicosanoids, hormones with local action that play a role in mediating inflammatory processes. Through the production of these eicosanoids, for the most part, essential fatty acids influence human health and disease All studies have previously confirmed that there is a relationship between supplementation with essential fatty acids and improved dry eye effect. (Elana S, 2010).

The effect of a treatment effect of omega-3 fatty acids for depression in adults is beneficial. Further study of essential fatty acids as an independent and adjuvant therapy for adult depression is indicated, including a more sophisticated investigation of response to certain doses. (Anna-leila, 2006).

Recently, demonstrated shown that supplementation with ω-3 polyunsaturated fatty acids, obtained from fish oil (ω-3 LCPUFAs) during gestation reduces the risk of asthma in children, but the mechanisms involved are not known (Daniela Rago, 2019).

MATERIAL AND METHOD

To obtain the two dairy products for analysis, sheep milk collected in April was used. It has a lower fat and higher protein content. In order to enrich the dairy products in essential fatty acids, in the raw material milk, a fish fillet from cod liver was added. In order to include the fish oil inside the fat globules the milk mixture with fish oil was homogenized at 70 ° C and the pressure of 200 bar. The classic technological process was used to obtain the products. In order to avoid the oxidation of the essential fatty acids, the maturation of the cheese samples was accelerated by increasing the maturation temperature by approximately 2-3 ° C. In order to remove the oxidation of the essential fatty acids, the maturation of the cheese samples was accelerated by increasing the maturation temperature by approximately 2-3 °C.

The raw material milk was analyzed from a physico-chemical point of view. The acidity determination was performed by the titratable method and expressed in both °T and grams of lactic acid%. The fat percentage determination was performed by the acid-butyrometric method and the density determination by the areometric method. Also, the analysis of the physico-chemical parameters of the milk was carried out with the help of the lactostar apparatus, which also determines the percentage of protein, lactose, non-fat dry substance in milk, in addition to the usual parameters.

The analysis on technological flow was carried out by tracking the parameters of the process operations but also of the milk parameters, especially the evolution of the acidity of the samples. Finished products were analyzed from the sensory and physical-chemical point of view. Was followed in this particular flavor and aroma of the products are influenced by the addition of fish oil. The physico-chemical was determined, the dry matter by the drying method in the oven, the percentage of fat by the acid-butyrometric method, the percentage of salt by the Mohr method.

Chromatography analyzed 19 fatty acids from milk samples but also from dairy products obtained. It has focused on the analysis of the evolution of the three essential fatty acids that are specific to both sheep's milk and fish oil. The results of the analyzes were statistically validated using the comparison method between the samples and the control sample, Anova. The ROC (Receiver Operator Characteristic) curves were used to establish the maximum point of incorporation at the optimum percentage of fish oil added to the raw milk.

RESULTS AND DISSCUSIONS

In this work it was analyzed by embedding the essential fatty acids from fish oil added to the raw milk in the milk product acid, sane, compared to fresh teleme cheese. Fish oil was added in increasing percentages of 0,05%; 0,10%; 0,15%. The coding of the samples is presented in the table 1.

Table 1

Coding of samples

No. cr.	Add fish oil %	Sample code		
		Milk raw material	Sane	Fresh teleme cheese
1	0	L_0	S_0	Tp_0
2	0,0,5	$L_{0,05}$	$S_{0,05}$	$Tp_{0,05}$
3	0,10	$L_{0,10}$	$S_{0,10}$	$Tp_{0,10}$
4	0,15	$L_{0,15}$	$S_{0,15}$	$Tp_{0,15}$

The concentrations in essential fatty acids of milk samples and milk products are shown in table 2.

Table 2

Concentration in essential fatty acids of sheep milk and sane samples and fresh telemea depending on the percentage of fish oil added

No. cr.	Sample	Concentration in essential fatty acids of samples		
		linoleic acid	linolenic acid	**γ** -linolenic acid
1	L_0	2,55	0,97	0,92
2	$L_{0,05}$	2,68	1,00	0.84
3	$L_{0,10}$	2,75	1,06	0,96
4	$L_{0,15}$	3,01	1,10	0,96
5	S_0	2,68	1	0,84
6	$S_{0,05}$	2,79	1,12	0,95
7	$S_{0,10}$	2,9	1,25	1,04
8	$S_{0,15}$	3,24	1,3	1,21
9	Tp_0	2,58	0,31	0,85
10	$Tp_{0,05}$	2,87	1,24	0,95
11	$Tp_{0,10}$	2,80	0,84	1,07
12	$Tp_{0,15}$	2,82	1,09	0,99

As can be seen from table 2, with the addition of fish oil, the concentration of essential fatty acids in both the sane and the fresh teleme cheese increases. Figure 1 shows the evolution of the essential fatty acids in the samples of raw material milk, those of sane and fresh teleme cheese. In general, there is a marked increase in the health samples compared to the cheese samples.

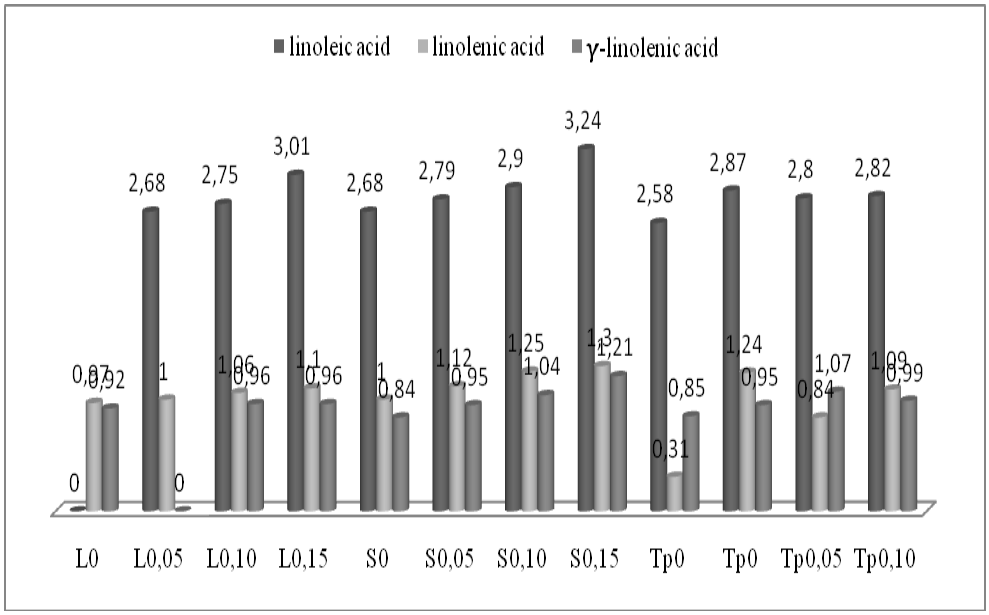

Fig. 1. Variation of essential fatty acids in milk and dairy products

From the statistical analysis the maximum limit of incorporation results, taking into account the three fatty acids analyzed. As shown in Table 3, the concentration in fish oil corresponding to the maximum incorporation limit is within the established fish oil concentrations (0,905%; 0,10%; 0,15%).

Table 3

Concentration in fish oil of raw material milk at the theoretical threshold of incorporation of essential fatty acids

	Concentration in fish oil of raw material milk at the theoretical threshold of incorporation of essential fatty acids		
	linoleic acid	linolenic acid	γ -Linolenic acid
Fresh teleme cheese	0,1600	0,1716	0,4668
Sane	-	0.6505	1.3200

CONCLUSIONS

The addition of fish oil in the raw material milk used in the manufacture of sane and fresh teleme cheese has the effect of enriching them in essential fatty acids. There is, for all that, a limit to the incorporation of fish oil into the milk fat globule. This shows that enrichment in essential fatty acids is more effective in the case of sane compared to the fresh telemea cheese.

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