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COMPARISON BETWEEN THE MAXIMUM DEGREE OF INCORPORATION OF ESSENTIAL FATTY ACIDS IN YOGURT COMPARED TO FRESH SPUN PASTE CHEESE

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Abstract

In this paper we tried to obtain two dairy products of different classes enriched in essential fatty acids. It has been the manufacture of a acid milk product and a cheese sortment. In the class of acid dairy products the manufacture of yogurt was chosen and in the cheese class the manufacture of spun paste cheese was chosen. It was followed by the incorporation of the fish oil added in the raw material milk into the fat globules of the sheep milk used in the manufacture of the products. In order to determine the maximum limit of incorporation, three successive concentrations of fish oil in milk were used: 0.05%; 0.10%; 0.15%. We analyzed three essential fatty acids that are specific for both sheep's milk and fish oil. It obtained an increase in the proportion of essential fatty acids in the samples with added fish oil as compared with the control. In the case of linoleic acid from 2,55% to 2,88% in the manufacture of yogurt and from 2,53 to 2,93 in the manufacture of spun paste cheese. The proportion of linolenic acid increased from 0,97 to 1,15 for yogurt and from 0,89% to 1,15% for spun paste cheese and ***γ****-linolenic acid increased from 0,72 to 1,05 for yogurt and spun paste cheese from 0,87 to 1,05. The maximum embedding of essential fatty acids in milk fat exceeds the established maximum concentration in milk added fish oil (0,15%).*

Key words: sheep's milk, essential fatty acids

INTRODUCTION

The enrichment of food in functional foods is increasingly present in the contemporary world, contributing to the improvement of the quality of life. This contributes to the prevention of disease but also to the increase of the average age of the population.

Different microorganisms cause gastroenteritis through the mouth. Lactic acid bacteria have been shown to have antiviral action (Dong Joo Seo et all, 2020).

Lactic acid bacteria, in addition to the lactic acid they produce, can also create aromatic substances such as diacetyl, under maturing cheese conditions. (Yun-Jeong Choi et all, 2019).

After lactic fermentation pH changes occur. The effects determined by pH (pH <5.5) led to changes in the structure of milk protein. (He Ni et all, 2019).

The concentration in protein, especially in whey protein, of the raw material milk positively influences the quality of dairy products both in terms of their consistency as well as their taste and aroma. Also the percentage of milk fat but also the degree of homogenization of milk fat have a beneficial effect on the quality of dairy products, influencing the consistency, taste and aroma. The degree of homogenization of milk fat has the effect of milk whitening because there are smaller particles and more light reflecting (Ni Cheng et all, 2019).

Milk and dairy products are important sources of nutrients in the human diet. However, they are also the main sources of saturated fatty acids that can increase the risk of cardiometabolic and cardiovascular disease. Unfortunately, the essential fatty acids, which are known for their health benefits, are found in small quantities in the normal fat of ruminant milk and in dairy products. That's why enriching dairy products in essential fatty acids is beneficial for health (Solomon Gebreyowhans et all, 2019).

The presence of free amino acids, essential free amino acids, free with branched chain amino acids (leucine, isoleucine and valine) is specific to cheeses obtained from sheep's milk. This fact determines the high nutritional and biological value of these products (Reis Lima et all, 2019).

Essential fatty acids are nutrients needed to maintain vital functions, improve the immune system and disease resistance. A diet with the lowest content of ω-3 resulted in a higher incidence of hepatic granulomas, which suggests a possible relationship between essential fatty acid deficiency and hepatic granulomatosis. (Marta Carvalho et all, 2019).

Dry eye is a common disease that can seriously affect quality of life. Essential omega-3 and omega-6 fatty acids are beneficial for patients with eye disease and have shown promising results (Ammar M, 2014).

By using vegetable oils, the rheology of the products is improved. It favors the emulsification of the fat and the products become creamier (Morna Anamaria, 2018).

The dietary intake of essential fatty acids from corn, supplemented with fish oil has cardioprotective effects (Refaat A. Eid et all, 2019).

It has been demonstrated that consumption of saturated fat replacement of essential fatty acids can protect the alveolar bone loss which suggests a therapeutic benefit of fish oil in hypercholesterolemic patients (María Eugenia Antona et all, 2020).

MATERIAL AND METHOD

The production of the products was carried out under the manufacturing regime. It was used as a raw material sheep's milk from the first lactation period to which was added fish oil to enrich the products in

essential fatty acids. The milk was pasteurized at medium temperature (72-74 ° C; for 30 sec). As additional operation was carried out in order to split the homogenization of milk fat globules for the purpose incorporation of fish oil in the inside thereof. The raw material milk for the manufacture of the yogurt was treated with high temperature superilmentary heat for the advanced destruction of the microorganisms in the spontaneous microflora of the milk for inoculation with selected lactic culture specific for the yogurt.

To obtain the cheesecloth, the curd was made which was matured to the optimum acidity (176 °T) of the scrap. The cheese was scalded at 85 °C.

In the process of obtaining yogurt and spun paste cheese, analyzes were made for the raw material milk, on the technological flow and the finished product.

For the raw material milk, the physico-chemical characteristics were analyzed. The acidity analysis was performed by titration and the result was expressed both in ° T (Thörner) and in grams of lactic acid expressed as a percentage. The determination of the percentage of fat was performed first by the acid-butyrometric method, the density analysis was performed areometrically. At the same time, the raw material milk was analyzed in an electronic system using the Lactostar apparatus which also determines the percentage of dry matter, proteins and lactose.

The technological flow followed the temperature and the time of operations, the acidity of the products.

The final products were analyzed from an organoleptic and physico-chemical point of view.

Sensory products were analyzed by 5 unauthorized persons. The acidity analysis was performed by the titratable method and the results were expressed in ° T and g lactic acid%. The analysis of the dry substance was carried out by the drying method in the oven, the analysis of the percentage of fat by the acicobutyrometric method and the determination of the salt percentage by the Mohr method.

Fatty acid analysis was performed by gas chromatography. 19 fatty acids were analyzed but the focus was on the analysis of three essential fatty acids which are representative for both fish oil and sheep's milk.

RESULTS AND DISSCUSIONS

The coding of the samples is presented in the table 1

Table 1

Coding of the samples

No. cr.	Addition fish oil %	Sample code	
		Yogurt	Fresh spun paste cheese
1	0	I_0	Cp_0
2	0,0,5	$I_{0,05}$	$Cp_{0,05}$
3	0,10	$I_{0,10}$	$Cp_{0,10}$
4	0,15	$I_{0,15}$	$Cp_{0,15}$

The sensory analyzes concluded that the taste and aroma of fish is not perceived at concentrations of 0.05% and 0.10% of fish oil and in samples with a concentration of 1.15% added of fish oil the taste and aroma of fish they disappeared after 24 hours of storage.

Physico-chemical analyzes of the raw material milk, on the technological flow and the finished product showed that there are no significant differences between the samples with added fish oil and the control samples, without addition.

The evolution of the proportion of the three essential fatty acids analyzed is presented in table 2.

Table 2

Concentration in essential fatty acids of sheep's milk and fresh yogurt and fresh spun paste cheese samples depending on the percentage of added fish oil

No. cr.	Sample	Concentration in essential fatty acids of samples		
		Linoleic acid	Linolenic acid	γ -linolenic acid
1	I_0	2,55	0,97	0,72
2	$I_{0,05}$	2,64	1,00	0,76
3	$I_{0,10}$	2,83	1,07	0,85
4	$I_{0,15}$	2,88	1,15	1,05
5	Cp_0	2,53	0,89	0,87
6	$Cp_{0,05}$	2,83	1,08	0,91
7	$Cp_{0,15}$	2,93	1,15	1,05

Table 2 shows results an increase in the proportion of three essential fatty acids analyzed in the samples with added fish oil.

Figure 1 shows an increase in the proportion of the three essential fatty acids in proportion to the concentration of fish oil of the raw milk.

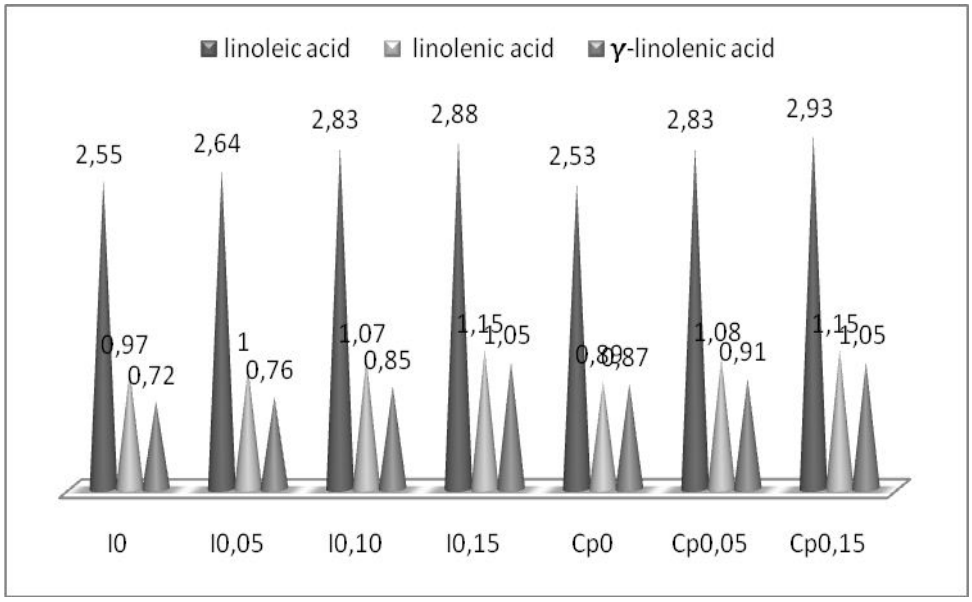

Figure 1 Evolution of the proportion of essential fatty acids in the samples with the addition of fish oil compared to the control sample

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 spun paste cheese	0,3773	0,3970	0,7694
Yogurt	0,7294	1,3825	-

Table 3 presents the limit of incorporation of the essential fatty acids depending on the concentration of milk fish oil. It is observed that the maximum incorporation limit of the three essential fatty acids exceeds the maximum concentration established (0.15%). In yogurt there is no maximum limit of **γ**-linolenic acid. This is due to the heat treatment of the raw material milk during which there is the possibility of thermal splitting of the fat cell membrane.

CONCLUSIONS

The manufacture of dairy products enriched in essential fatty acids is possible by adding fish oil to the raw material milk by homogenizing the mixture of milk with fish oil to obtain a good inclusion of the essential fatty acids inside the fat globule. To eliminate the fish taste and aroma of the products, the mixture of milk raw material with fish oil can be deodorized.

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