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CONCENTRATION IN ESSENTIAL FATTY ACIDS OF FISH OIL COMPARED TO SANE ENRICHED ESSENTIAL FATTY ACIDS

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Abstract

In this paper we try to enrich the acidic dairy product sana in essential fatty acids by adding fish oil in the raw milk of sheep's milk. The aim is to incorporate these acids from the composition of fish oil into the fat globule of milk, thus being absorbed into the human body with milk fat which is assimilated in a proportion of 95%. For this purpose, the mixture of milk and fish oil was homogenized because through this process the membranes of the milk fat globule split and the fat in the fish oil adheres to the milk fat. After, fat globule membranes are restored by incorporating the fat from the fish oil and thus the milk used in the manufacture of the product is enriched in essential fatty acids. There is the disadvantage that the finished product receives the taste and aroma of fish which can be removed by deodorization.

For comparison and to determine the optimal concentration of fish oil to be added to the milk at the optimal point of incorporation of fatty acids in the fat globule, 4 samples of sana were made: one sample without addition of fish oil, considered as a control sample and three samples with progressive additions of 0,05%; 0.10% and 0.15%. The fatty acid concentration of fish oil and sana samples were analyzed by gas chromatography. Three essential fatty acids that are specific to both milk and fish oil composition were analyzed. They were obtained values of the concentration of essential fatty acids were obtained in relation to the total fatty acids:

- in the case of fish oil the concentration in linoleic acid is 3.35%, in linolenic acid 9.20% and γ-linolenic acid 2.18%;

- in the case of sane the concentration in:

- linoleic acid is 2.68 for the sample without the addition of fish oil, 2.79 for the sample with the addition of 0.05%; 2.9 for the addition of 0.10% and 3.24% for the addition of 0.15% fish oil;

- linolenic acid is 1.00% for the sample without the addition of fish oil, 1.12% for the sample with the addition of 0.05%; 1.25 for the addition of 0.10% and 1.30% for the addition of 0.15% fish oil;

- γ-linolenic acid is 0.84% for the sample without the addition of fish oil, 0.95 for the sample with the addition of 0.05%; 0.85 for the addition of 0.10% and 1.05% for the addition of 0.15% fish oil.

Key words: sane, essential fatty acids, fish oil

INTRODUCTION

Milk and dairy products contain all the elements necessary for life and they are in optimal concentrations. Milk and dairy products are often a significant part of the human daily diet and provide proteins of animal origin with high biological value for the growth and functioning of the human body. Milk processing technologies affect the structural and functional properties of proteins that are more easily digestible in the gastrointestinal tract (Zuhaib F.2021).

The fat globule membrane is very rich in bioactive compounds that increase human life hope. It has been found that the addition of phospholipids in milk, lecithin, has the role of protecting the fat cell membrane in the process of homogenizing milk. It aims to obtain functional dairy products (Naiyan Lu, 2021).

Lactose plays an essential role in the composition of milk, and the low lactose content negatively affects the production of dairy products. Analysis of lactose content in milk was positively associated with fat and protein content, as well as negatively associated with pathogenic bacteria. Their increases are associated with a reduction in the lactose content of milk, without the influence of variations in fat and protein content. Plus, the total dry matter in milk, which accounts for most of the milk's components, affects the quality of the milk. (Dileta Regina MoroAlessio, 2021).

Organophosphorus pesticides (PPOs) are a group of common residual pollutants in food that cause serious negative effects to human health. The ability of 10 lactic acid bacteria (LAB) to degrade OPPs for their potential to degradation OPPs in fermented dairy products was studied. The results showed that some LABs can survive in the presence of OPPs and decompose them significantly in a short time. Of these, Lactobacillus plantarum subsp. plantarum (L. plantarum 20261) showed the highest decomposition capacity. The phosphatase produced by this bacterium could rapidly degrade OPPs in vitro. In addition, the excellent antioxidant capacity of Lactobacill and its tolerance to simulated gastric and intestinal juices have shown their potential protective effects against negative oxidative effects induced by pesticides (ShaofengYuan, 2021).

Parkinson's disease (PD) is a neurodegenerative process that affects motor function and involves an inflammatory response and vitamin B deficiencies. Lactic acid bacteria (LAB) are a producer of B vitamins and immunomodulators. The three species of lactic bacteria, Lactobacillus plantarum CRL 2130 (a producer of riboflavin), Streptococcus thermophilus CRL 807 (an immunomodulatory strain) and Streptococcus thermophilus CRL 808 (a producer of folate) have the ability to increase motor capacity, have positive effects on the brain and lead to a decrease in inflammatory

cytokines, an increase in the anti-inflammatory cytokine. This probiotic mixture could be used as a treatment to control Parkinson's disease (Daiana Perez 2020).

Fish is a clean food resource. For a balanced diet, the romanians need eat about two fish or two meals of seafood a week. According to statistics, at the moment in Romania we consume, on average, a fish meal every three weeks, which is extremely low (Morna Anamaria 2017).

It has been found that dietary supplementation with fish oil has a direct impact on preventing obesity and decreasing muscle mass (Shing-Hwa, 2021).

Essential fatty acids have many health benefits. Essential fatty acids as dietary supplements are used in the treatment of dry eyes to reduce inflammation in the eye surface (PoonamMudgil, 2020).

The additional intake of essential fatty acids seems to have a protective effect in some diseases such as cardiovascular disease, cancer and asthma (Miriam Isabel Souza dos Santos SimonMSc, 2020).

MATERIAL AND METHOD

In this study, an acidic dairy product, sana, was manufactured in order to obtain a functional product, enriched in essential fatty acids. Thus in the raw material was added fish oil which is rich in essential fatty acids. 4 samples were made: one without addition and three with progressive addition of 0.05%; 0.10% and 0.15%. The milk used was sheep's milk from the first lactation period, which is characterized by a higher casein content and a lower fat content. The aim is to incorporate the fish oil inside the fat globules by homogenizing the milk. Sheep's milk, with and without the addition of fish oil, was pasteurized in a short-term medium pasteurization regime at temperatures of 73°C for 30 seconds. Afterwards, both the milk without the addition of fish oil and the mixture were homogenized at a temperature of 70ºC and a pressure of 200 bar. In this way the fat globules are broken down, the fish oil adheres to the milk fat and then the fat globule is restored by incorporating the fats from the fish oil and thus the raw sheep milk may be enriched in essential fatty acids. Next, the technological process is the classic one for obtaining sane.

The finished product was sensorially analyzed by five unauthorized people.

From a physical-chemical point of view, the percentage of fat, dry matter and acidity was followed.

Essential fatty acids in finished products and fish oil were analyzed by gas chromatography.

In order to assess the incorporation of fish oil in the product, three essential fatty acids were analyzed, which are characteristic of both sheep's milk and fish oil, respectively linoleic acid, linolenic acid and γ-linolenic acid as a percentage comparison. Fatty acid concentrations are reported as% of total fatty acids.

RESULTS AND DISSCUSIONS

The coding of the samples is shown in table 1

Table 1

Coding of samples

No. cr.	Add fish oil %	Sample code	
		Sane	Fish oil
1	0	SN_0	FO
2	0,0,5	$SN_{0,05}$	FO
3	0,10	$SN_{0,10}$	FO
4	0,15	$SN_{0,15}$	FO

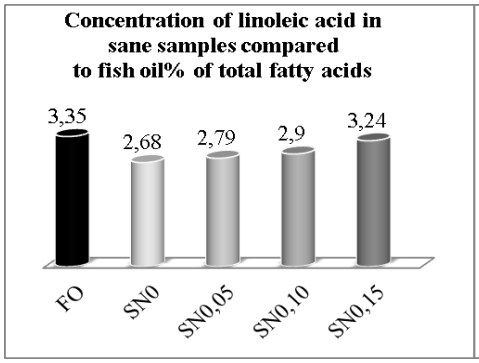

Figure 1 Concentration of linoleic (ω6) acid in sane samples compared to fish oil% of total fatty acids

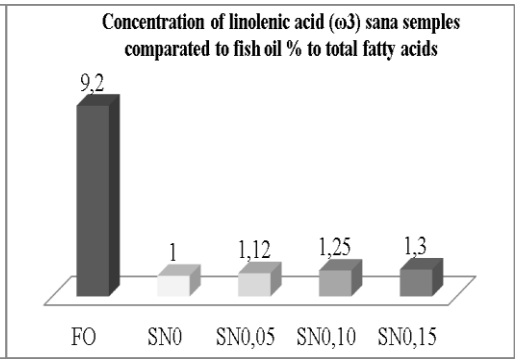

Figure 2 Concentration of linolenic acid (ω3)in sane samples compared to fish oil% of total fatty acids

Linoleic acid is found in the samples of sane compared to that of fish oil in a proportion of 7.37% in the samples with 0.05% added fish oil, 7.3% in the samples with the addition of 0.1% and 12 , 5 in the samples with 0.15% addition (figure 1).

With regard to linolenic acid, the situation is as follows: in the samples of 0,05% it is found in a proportion of 22,8%, in the samples with 0,1% in the proportion of 23% and in the samples with the addition of 0,15 % in proportion of 18.4% (figure 2).

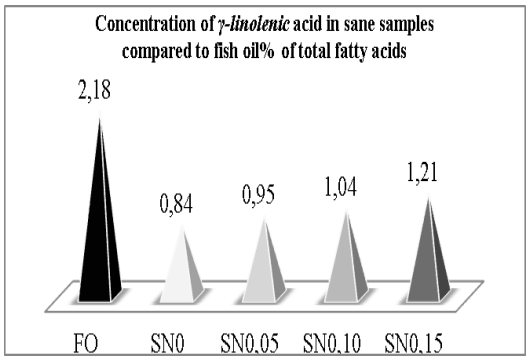

Figure 3 Concentration of γ-linolenic acid (ω3) in sane samples compared to fish oil% of total fatty

γ -linolenic acid is found in the samples of sane compared to that of fish oil in a proportion of 4.79% in the samples with 0.05% add fish oil, 4.3% in the samples with the addition of 0.1% and 5.3 in the 0.15% addition samples (Figure 3).

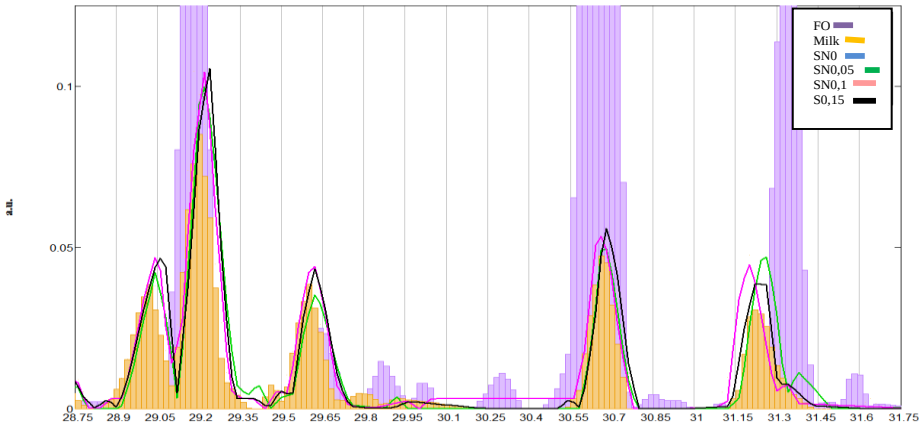

Figura 4 Graph of superimposed chromatograms of sana samples with and without the addition of fish oil – the area of detection of essential fatty acids

Figure 4 shows the areas of the chromatograms of essential fatty acids which are bigger in the case of samples with fish oil than those without addition but smaller than in fish oil, taking into account that the additions were also in small percentages (0,05%; 0,1%; 0,15%).

CONCLUSIONS

In conclusion, the fatty acids in fish oil are incorporated, approximately the same, taking into account the percentage added to the milk but it is different depending on the fatty acid analyzed. Respectively, compared to γ-linolenic acid, linolenic acid is found in the product in a proportion of 8 times higher and linoleic acid 1.5 times higher.

The addition of fish oil imprints the specific taste and aroma of fish samples of sana with the addition of 0.1 and 0.15% fish oil but which

disappears after three days of refrigeration. This inconvenience can be removed by deodorizing the milk.

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