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

Hîlma Elena*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: hilma_elena@yahoo.com

Abstract

Fish oil is a product rich in essential fatty with actions many health benefits. Milk is a product rich in saturated fatty acids with a large number of carbon atoms. Therefore, in this study, the aim is to enrich yogurt in essential fatty acids by adding fish oil to raw milk. For a better assimilation in the human body, the fat from the fish oil is tried to be incorporated into the membrane of milk fat globules. By homogenizing, the membrane of the milk fat globule splits and the fat in the fish oil will adhere to the milk fat. After that, the fat globules of the milk are restored with the incorporation of fatty acids from the fish oil. A It is being analyzed the concentration of three essential fatty acids that are characteristic of both fish oil and milk fat. It compares the proportion of these acids in the concentration of fish oil and yogurt samples. For this purpose, 4 yogurt samples were made: without addition of fish oil and with progressive additions in a concentration of 0,05%; 0.10% and 0.15%. The proportion of essential fatty acids is reported to the total fatty acids. The following values were obtained:

- 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 yogurt the concentration in:

- linoleic acid is 2.55% for the sample without the addition of fish oil, 2.64% for the sample with the addition of 0.05%; 2.83% for addition of 0.10% and 2.88% for addition of 0.15% fish oil;

- linolenic acid is 0.97% for the sample without the addition of fish oil, 1.00% for the sample with the addition of 0.05%; 1.07 for the addition of 0.10% and 1.15% for the addition of 0.15% fish oil;

- γ-linolenic acid is 0.72% for the sample without the addition of fish oil, 0.76% 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: yogurt, essential fatty acids, fish oil

INTRODUCTION

Yogurt is an acidic dairy product that contains lactic acid bacteria that role as probiotics in the body. On the other hand, due to its composition, it provides a nutritious substrate for the intestinal microflora with the role of

prebiotics. At the same time it has protein components indispensable to the human body.

The processing of milk and dairy products can induce several changes in proteins that change their structure due to enzymatic transformations that occur during digestion in the intestine. It has been found that non-thermal technologies, such as high pressure, ultrasound, pulsed light, microfluidization and microfiltration, induce structural changes in proteins that can increase enzymatic hydrolysis with their denaturation favoring digestion in the intestine. (Zuhaib F.Bhata, 2021).

The biochemical transformations of proteins during digestion have an effect on their absorption in the body. Acid coagulation of lactic proteins in the stomach is a unique interaction between the food source and their physiological action. Milk processing treatments (such as heat treatment and homogenization) beneficially influence the digestion of proteins in the body. The potential to produce healthy foods with different nutritional results by manipulating the restructuring properties of milk proteins is discussed (AiqianYe, 2021).

Lactose is a disaccharide made up of glucose and galactose, which is found exclusively in milk. Lactose is a food that provides energy to the body but also promotes the optimization of muscle and liver glycogen. Lactose can also act as a prebiotic, possibly promoting beneficial changes in the intestinal microbiota (Oliver Joseph, 2021).

Yogurt is a product consumed by people of all ages. Consumer preferences were analyzed according to fat content. Low-fat yogurt was more appreciated because of the the harder curd (P.G.I.Dias, 2020).

Milk fat is being studied more and more in the current period. The fat cell membrane is a component that seems to have very important components for the body. Genetic analysis showed that proteins in the fat cell membrane have important biological, nutritional and functional properties. The aim is to use these components to obtain functional dairy products (MohanLi, 2021).

The major effects of essential fatty acids (EFA) on brain structure and function are known. EFA determines the fluidity of the neural membrane and controls the physiological functions of the brain. EFA is also involved in the synthesis and functions of brain neurotransmitters and in immune system molecules. Because they must be provided from the diet, low bioavailability induces major disorders in the body. While the brain needs a continuous supply throughout life, there are two particularly sensitive periods - childhood and old age. EFA deficiency during childhood delays brain development, and during aging will accelerate the deterioration of brain functions (S.Yehudaa, 2005).

Despite the development of a number of vaccines for COVID-19, the need to prevent and treat the SARS-CoV-2 virus and the disease remains resulting COVID-19. It analyzes the key elements of SARS-CoV-2 and COVID-19 that can be easily treated: viral entry, immune system, inflammation and cytokine storm. It is shown that the essential nutrients: zinc, polyunsaturated fatty acids ω-3 (PUFA), vitamin D and magnesium provide the ideal combination for the prevention and treatment of COVID-19prevention of SARS-CoV-2 entry into host cells, prevention of SARS-CoV-2 proliferation, inhibition of excessive inflammation, improved control of immune system regulation, inhibition of cytokine storms and reduction of the effects of acute respiratory crisis syndrome (ARDS) and non-transmissible associated diseases (Michael J.Storya, 2021).

Fish oil is very rich in essential fatty acids. Food supplementation with this product has been shown to have a positive effect against obesity-associated breast cancer (Jennifer M.Monk, 2021).

Consumption of fish is very important for human health. Better information is needed for the population, especially in rural areas or small towns, to educate young people about the benefits of eating fish. Information is also needed on the qualities of different species of fish (Moarna Anamaria, 2017).

MATERIAL AND METHOD

For the manufacture of yogurt enriched in essential fatty acids, as a source of essential fatty acids, tuna liver oil from "HOFIGAL" was used, which was added to the raw milk. The raw material was sheep's milk from the first lactation period which has a lower fat percentage and an increased casein content. The mixture of sheep's milk and fish oil was pasteurized at 73º for 30 seconds. After that it was homogenized at temperatures of 70ºC and the pressure of 200 bar. It aimed to incorporate the essential fatty acids from fish oil into fat globule membranes. During the homogenization of this membrane, the fat in the fish oil adheres to the lactic fat and the membrane of the fat globules is restored, after which it incorporates the fish oil, thus enriching the product in essential fatty acids. Milk fat is 95% absorbed in the body and thus man also benefits from the positive effect of essential fatty acids in fish oil.

Next, the technological process used to obtain yogurt was the classic one.

The finished product was analyzed from an organoleptic point of view by 5 unauthorized panelists.

From a physical-chemical point of view, the density of milk was analyzed by the areometric method, the percentage of fat by the acid-butyrometric method and the acidity by the titratable method.

19 fatty acids were analyzed by gas chromatography. For comparison, three essential fatty acids that are characteristic of both fish oil and sheep's milk were analyzed.

RESULTS AND DISCUSSIONS

The coding of the samples is presented in table no. 1

Table 1

Coding of samples

No. cr.	Add fish oil%	Sample code	
		Yogurt	Fisf oil
1	0	Y_0	UP
2	0,0,5	$Y_{0,05}$	UP
3	0,10	$Y_{0,10}$	UP
4	0,15	$Y_{0,15}$	UP

After the sensory analysis, the taste and aroma of fish was felt in samples Y0,10 and Y0,15 but which disappeared after three days of maintenance at refrigeration temperature. The acidity and the percentage of fat evolved in the same way in both the sample without the addition of fish oil and the ones with the addition.

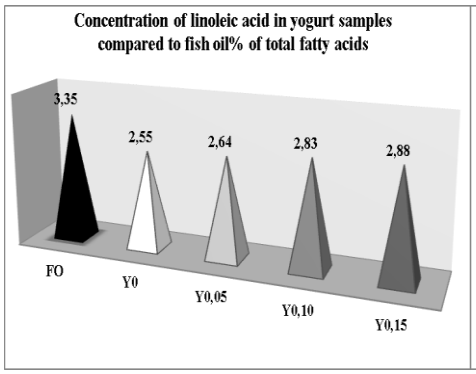

Figure 1 Concentration of linoleic acid (ω6)in yogurt samples compared to fish oil% of total fatty acids

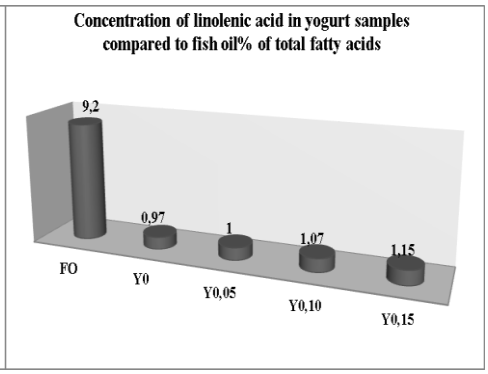

Figure 2 Concentration of linolenic acid (ω3)in yogurt samples compared to fish oil% of total fatty acids

Linoleic acid is found in yogurt samples compared to that of fish oil in a proportion of 6.03% in samples with 0.05% added fish oil, 9.3% in

samples with added 0.1% and 7 , 37 in the samples with the addition of 0,15% (figure 1) and the linolenic acid in proportion of 5,52% in the samples with 0,05% added fish oil, of 9,2% in the samples with the addition of 0,1 % and 11.04% in the samples with the addition of 0.15% (figure 2).

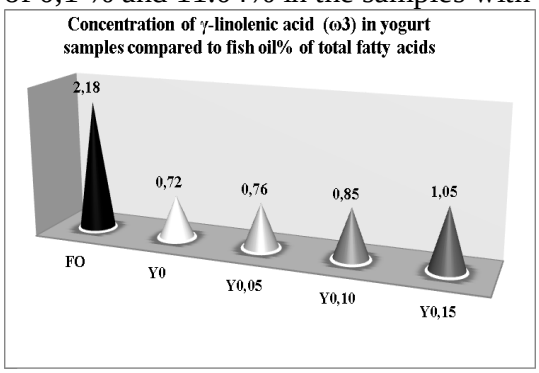

Figure 3 Concentration of γ-linolenic acid (ω3) in yogurt samples compared to fish

With regard to linolenic acid, the situation is as follows: in samples of 0,05% it is found in a proportion of 1,74%, in, in samples of 0,1% in a proportion of 2,834% and in samples with an addition of 0,15 % in proportion of 4,796% (figure 3).

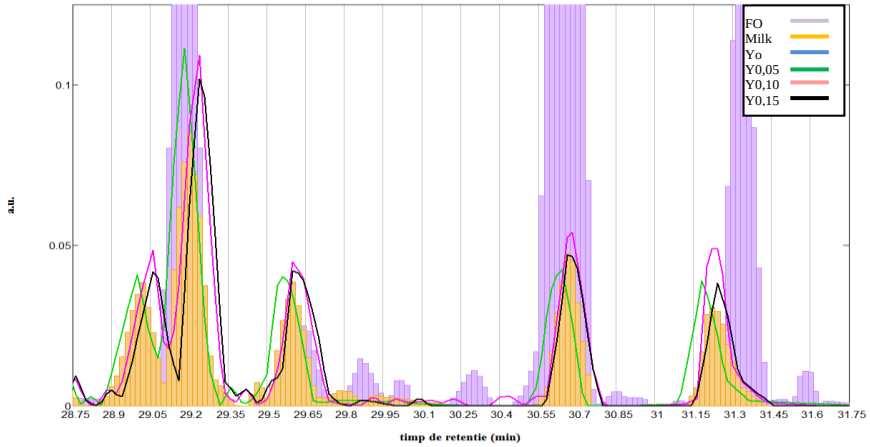

Figure 4 Graph of superimposed chromatograms of yogurt samples with and without the addition of fish oil – the area of detection of essential fatty acids

Figure 4 shows that the graphs of the chromatograms of the essential fatty acids in the enriched yoghurt samples fall between those of the fish oil and those without addition.

CONCLUSIONS

The proportions of essential fatty acids are approximately the same in samples with the addition of fish oil if the concentrations added to the raw milk are taken into account. There are differences if we consider different fatty acids. It is found that ω6 is found almost three times more

than ω3 in fish oil samples compared to all of the fatty acids and taking into account the added concentrations.

In conclusion, the essential fatty acids in fish oil can be incorporated into the membrane of the fat globule of sheep's milk to obtain yogurt as a functional product.

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