THE THRESHOLD EMBEDDING ESSENTIAL FATTY ACIDS IN YOGURT

Hîlma Elena*

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

Abstract

Yogurt, dairy acid, that contains lactic acid bacteria that enrich the microflora in the digestive tract of the human body and protein substances that contain all essential amino acids. Milk fat is considered a fat increases cholesterol and therefore by acet study, followed enrichment yogurt from sheep's milk with fatty acid esesnţiali. For this reason introduced in raw milk fish oil in three different concentrations by homogenisation to embedded fish oil inside the globule of fat and was intended maximum potting taking study three essential fatty acids that are found in both oil fish and in milk fat. The following values were obtained for the concentration of fish oil to the raw milk for the three fatty acids on the degree of saturation of the fat globule theory of the essential fatty acids must be taken into consideration: 0.729418941%-linoleic acid, linolenic acid-1.382539647 and if γlinolenic-acid threshold is not reached theoretical saturation to 0.15% fish oil added.

Key words: yogurt, essential fatty acids

INTRODUCTION

Milk quality and heat treatments undergone by particularly affects the lactose in milk composition. The most important changes in the heat treatment of milk and lactose are the Maillard reaction of proteins which take place at high temperatures. Using enzyme fructosaminoxidază gave positive results in slowing these reactions and the formation of amino acids after denaturation of proteins (Antonio Dario Troise, 2016).

They were studied in parallel fatty acids from sunflower oil (rich in oleic acid), canola oil (rich in monounsaturated fatty acids), palm (rich in saturated fatty acids) compared with fatty acids from fish oil. It concluded that fish oil is the most rich in polyunsaturated fatty acids and digested most easily in the human body (Chaiw-Yee Teoh, 2016).

The content of saturated fatty acids can decrease and to increase the concentration in yogurt and in short chain saturated fatty acid when used in the culture of lactic bacteria selected for lactic acid fermentation of milk by Lactobacillus rhamnosus (Ru Jia, 2016).

Fish oils have many dietary benefits, but because of strong odors and rapidly deteriorating, their application in the manufacture of food products is limited. For these reasons, the fish oil used was encapsulated to obtain yoghurt. . The physico-chemical properties of yoghurt, including pH, acidity, syneresis, fatty acid composition, the peroxide value and sensory tests were investigated during storage for three weeks at 4 ° C. It has significantly reduced acidity, syneresis and index of peroxide. The results of chromatographic analyzes showed that after 21 days of storage, yogurt enriched with fish oil encapsulated has a higher content of essential fatty acids than yogurt containing fish oil free and sensory qualities are closer to the yogurt without added fish oil (Tahere Ghorbanzade, 2016).

In natural sheep's milk yogurt has been incorporated to enrich fish oil essential fatty acids. To this end milk mixed with fish oil was subjected to homogenization and pasteurization heat treatment under high. This has a beneficial effect on the formation of the emulsion and does not affect the essential fatty acids (Michelli F. Dario,2016).

The benefits of essential fatty acids in fish oil have been studied in mice and was followed effect on renal functions and obesity. The results were significant (Isabela Coelho, 2016).

Low levels of serum testosterone are typically associated with diabetes, coronary arteriosclerosis, insomnia, rheumatoid arthritis and chronic pulmonary diseases. Testosterone replacement therapy is effective against many of these disorders, indicating the importance of maintaining a healthy level of testosterone. In this regard, we investigated the effects of fish oil on the metabolism of testosterone. Testosterone was evaluated in mice who received the fish oil and it has been concluded that eicosapentaenoic acid is involved in the metabolism of testosterone (Nobuhiro Zaima, 2016).

A high fat diet can lead to obesity, chronic metabolic diseases, and adversely affects the central and peripheral system. Dietary supplements that are rich in omega-3 polyunsaturated fatty acids can decrease or prevent the negative health consequences but importantly is the fact that increases the body's resistance to the harmful effects of cocaine (Katherine M., 2016).

Food supplementation with fish oil has been shown to be beneficial in regulating the enzymatic activity with a role in lipid metabolism and decrease body fat (Hossein Zakariapour Bahnamiri, 2016).

MATERIALS AND METHODS

To obtain yogurt was used sheep milk with known physico-chemical characteristics (Mierliță D., 2009), which was added fish oil fatty acids esesnţiali enrichment. Sampling averages analysis: raw milk: according S.TA.S. 9535 / 1-74; STA.S. 9535 / 2-74.

Organoleptic test: Milk products acids: according S.T.A.S. 6345.

Determination of titratable acidity: raw milk: according S.R. ISO 6091/2008;
(expressing the acidity was done in ° T , ° Sh and g lactic acid %) and products acidic: according: according S.R. ISO 6091/2008.

Determining pH, was used pH meter: the brand HANNA.

Determination of fat content: Milk raw material, according S.T.A.S. 6352 / 1-88 and dairy products acidic: according S.TA.S. 6352 / 2-87;

Gas chromatographic analysis of fatty acid for evaluating the biological value of sheep milk and dairy products was considered generally their components acids and essential fatty acids in particular. They determined 19 fatty acids: saturates (SFA), monounsaturates (MUFA) and polyunsaturates (PUFA). Also fatty acids were analyzed taking into account the evolution of the fatty acid groups of the studied samples. The analysis results are expressed as a percentage to total fatty acids. Extraction of the fat from milk was carried out by mixing 1 ml of milk yogurt well were well mixed and added 0.6% ammonia solution, 2 ml of ethanol, 4 mL of ethyl ether and 4 ml. hexane after which the mixture was stirred for 3 min. Transesterification of fatty acid methyl esters was carried out by reaction with boron trifluoride / methanol at 80 ° C for two hours in a closed Pyrex glass tube. The content was transferred to a separating funnel. Extraction of methyl esters was performed using 10 ml of hexane. The 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. Gas chromatographic analysis was performed using a Shimadzu gas chromatograph GC-17A equipped with a capillary column Chrompack with a length of 25 m and a diameter of 0.25 mm, stationary phase (a derivative of polyethylene glycol) is deposited in the column form a thin film of 0.2 μm. It used a FID detector and the mobile phase was helium 99.9% purity.

Methods of statistical analysis: for multiple comparisons were used Tukey's test, and Fisher Dukan. For comparison with the control Dunnett's test was used. Limit of embedding of the fatty acids in the fat globule was determined using the ROC curve (Receiver Operator Characteristic), (Teusdea, A. 2008, 2009).

RESULTS AND DISCUSSIONS

Analysis of essential fatty acids incorporation of yogurt in the samples: figure 1 shows the graph superimposed chromatograms of samples with and without added yogurt and fish oil - area detection of essential fatty acids studied. The yogurt samples, due to the high temperature pasteurization, there are abnormalities in the incorporation of fish oil in milk fat globule that is reflected in the order of the amplitude of the areas of the chromatograms. Nevertheless it can be seen that the surfaces of samples fall between those of fatty acids in milk and fish oil. To ensure better embedding could reduce the pasteurisation temperature as high temperature heat splits fat globule membranes.

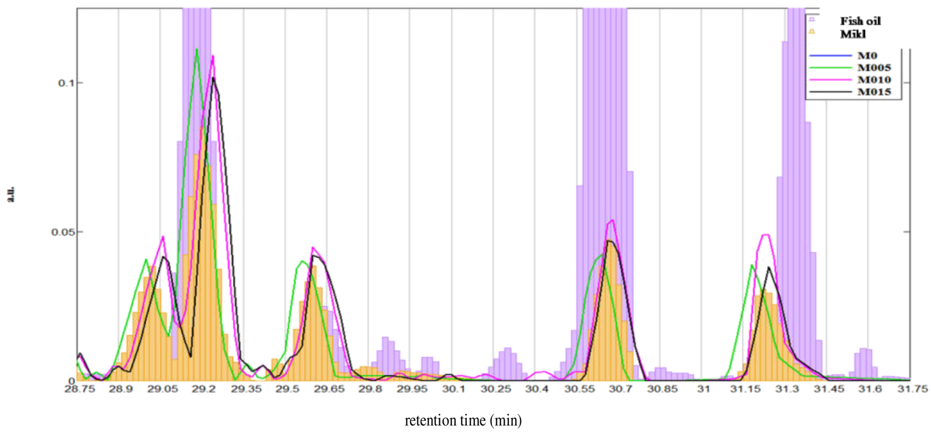

Figure 1 The graph superimposed chromatograms of yogurt samples with and without added and fish oil - area detection of essential fatty acids studied

Analysis of the incorporation of linoleic acid in the samples of yogurt: Table 1 shows the threshold values of the asymptotic accuracy of 0.0001% in the concentration of fish oil in three forms.

Table 1

The threshold values of embedding linoleic acid in yogurt

precision	saturation threshold (of regression values)	saturation threshold (of derivative regression values)	saturation threshold (theoretically)
0.0001	2.897794841	2.897893822	0.729418941

Although the three values are not equal, it can be seen that the two numerical values determined are in close proximity and in Figure 2 have the clearance graphics.

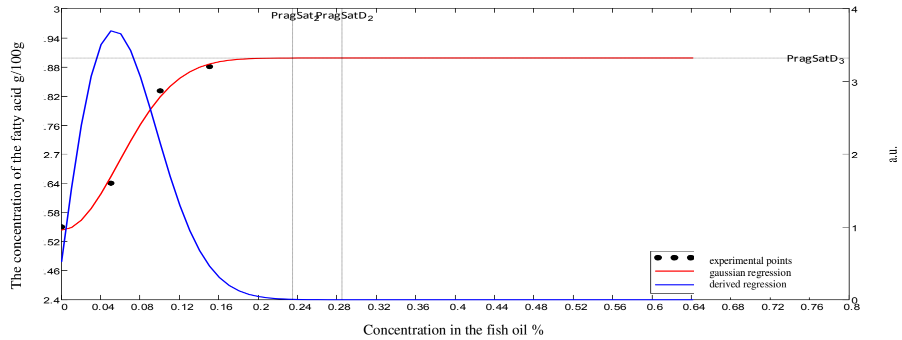

Figure 2 Determination of the threshold of embedding linoleic acid in yogurt

Analysis of the incorporation of linolenic acid in the samples of yogurt: Table 2 shows the threshold levels of linolenic acid potting fat globule accuracy of 0.0001% in the concentration of fish oil raw milk. It is noted that the two numeric values determined are very close and they figure 3 and graphical validation interval which is marked by a dotted line.

Table 2

The threshold values of embedding linolenic acid in yogurt

precision	saturation threshold (of regression values)	saturation threshold (of derivative regression values)	saturation threshold (theoretically)
0.0001	1.270784722	1.271067845	1.382539647

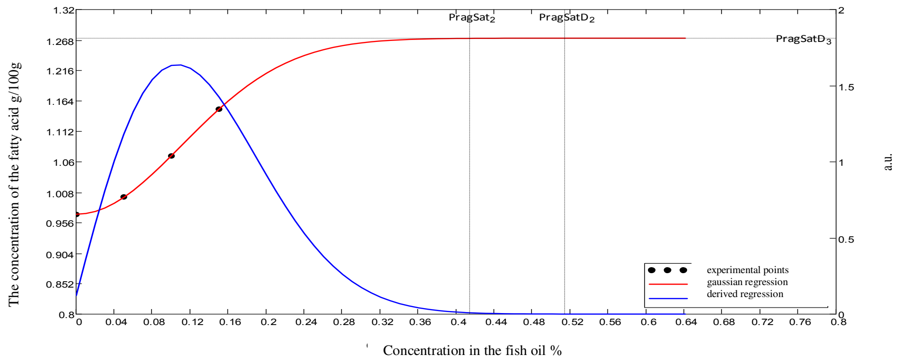

Figure 3 Determination of the threshold of embedding linoleic acid in yogurt

Analysis of the incorporation of γ-linolenic acid in the samples of yogurt: graphs of the results are shown in Figures 4 and 5.

If production from sheep's milk yogurt with ados fish oil with enrichment composition in essential fatty acids, γ-linolenic acid if the results shown in Figures 4 and 5. It follows that the additions of fish oil in a percentage of up to 0.15% does not achieve the maximum embedding of this acid in the fat globule of yogurt.

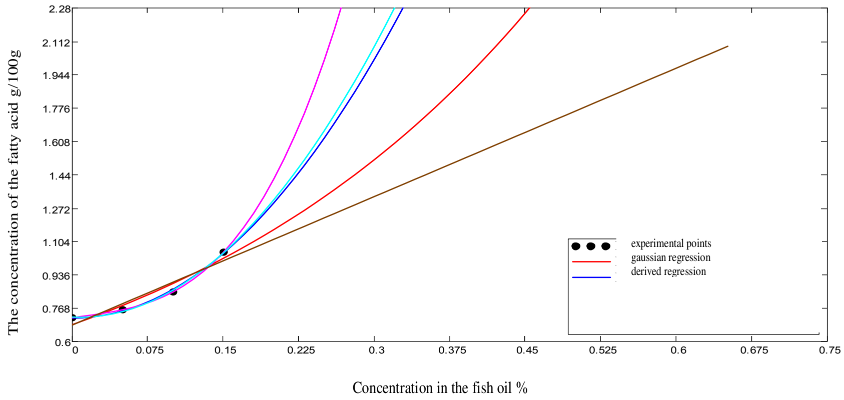

Figure 4 Determination of the threshold of embedding γ-linolenic acid in yogurt

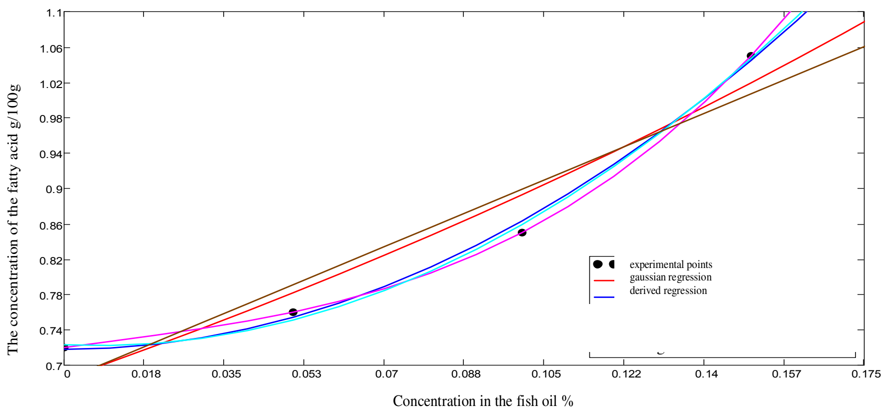

Figure 5 Determination of the threshold of embedding γ-linolenic acid in yogurt (detail of the preceding figure)

CONCLUSIONS

Accordingly fat molecule can incorporate fish oil rich in essential fatty acids a membrane lipoprotein protection role fat. The percentage of fish oil is added appropriate, given that under industrial conditions losses are higher than under laboratory conditions.

REFERENCES

1. Antonio Dario Troise, Martina Buonanno, Alberto Fiore, Simona Maria Monti, Vincenzo Fogliano, 2016, *Evolution of protein bound Maillard reaction end-products and free Amadori compounds in low lactose milk in presence of fructosamine oxidase I*, Food Chemistry, Volume 212, 1 December 2016, Pages 722-729,
2. Chaiw-Yee Teoh, Wing-Keong Ng, 2106, *The implications of substituting dietary fish oil with vegetable oils on the growth performance, fillet fatty acid profile and modulation of the fatty acid elongase, desaturase and oxidation activities of red hybrid tilapia,* Oreochromis sp.Aquaculture, Volume 465, 1 December 2016, Pages 311-322;
3. Coelho Isabela, Danielle C.T. Pequito, Gina Borghetti, Júlia Aikawa, Adriana A. Yamaguchi, Gleisson A.P. de Brito, Ricardo K. Yamazaki, Anderson P. Scorsato, Luiz Claudio Fernandes, Terezila Machado Coimbra, Ricardo Fernandez, *Chronic fish oil supplementation partially reverses renal alterations in mice fed with a high-fat diet,* Journal of Functional Foods, Volume 26, October 2016, Pages 196-207,
4. Hossein Zakariapour Bahnamiri, Mahdi Ganjkhanlou, Mostafa Sadeghi, Mohammad Jjavad Najaf-panah, Abolfazl Zali, Wang ZuYang, 2106, *Effects of fish oil supplementation and supplementation period on adipose tissue generation sites and the gene expression of enzymes involved in metabolizing adipose tissue in Holstein bulls under various forage types,* Agri Gene, Volume 1, August 2016, Pages 72-78;
5. Katherine M. Serafine, Caitlin Labay, Charles P. France, 2106, *Dietary supplementation with fish oil prevents high fat diet-induced enhancement of sensitivity to the locomotor stimulating effects of cocaine in adolescent female rats,* Drug and Alcohol Dependence, Volume 165, 1 August 2016, Pages 45-52;
6. Michelli F. Dario[a, ,], M. Soledade C.S. Santos[b], Ana S. Viana[b], Elizabeth P.G. Arêas[c], Nádia A. Bou-Chacra[a], M. Conceição Oliveira[d], Manuel E. Minas da Piedade[b], André R. Baby[a], Maria Valéria R. Velasco[a], 2016, *A high loaded cationic nanoemulsion for quercetin delivery obtained by sub*-PIT method, Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 489, 20 January 2016, Pages 256–264
7. Mierliţă D., C. Maerescu, St. Daraban, F. Lup. 2009. *Effects of energy and protein content in the diet on milk yield and milk fatty acid profile in dairy ewes*. Bulletin USAMV Cluj-Napoca, Animal Science and Biotechnologies, 66(1-2), ISSN 1843-5262, p: 67-73.
8. Mierliţă D., F. Lup, C. Maerescu. 2009. *Nutritional and technological factors inorder to obtain functional food enriched with PUFA Omega 3*

and CLA at sheep: a review. Analele Univ. din Oradea, Fascicula: Ecotoxicologie, Zootehnie şi Tehnologii de Industrie Alimentară, ISSN 1583-4301.
9. Nobuhiro Zaima, Saori Kinoshita, Nao Hieda, Hirona Kugo, Kaori Narisawa, Ayami Yamamoto, Kenichi Yanagimoto, Tatsuya Moriyama, 2106, *Effect of dietary fish oil on mouse testosterone level and the distribution of eicosapentaenoic acid-containing phosphatidylcholine in testicular interstitium,* Biochemistry and Biophysics Reports, Volume 7, September 2016, Pages 259-265;
10. Ru Jia, Han Chen, Hui Chen, Wu Ding, 2106, *Effects of fermentation with Lactobacillus rhamnosus GG on product quality and fatty acids of goat milkyogurt,* Journal of Dairy Science, Volume 99, Issue 1, January 2016, Pages 221-227;
11. Tahere Ghorbanzade, Seid Mahdi Jafari, Sahar Akhavan, Roxana Hadavi, *Nano-encapsulation of fish oil in nano-liposomes and its application in fortification of yogurt,* Food Chemistry, Volume 216, 1 February 2017, Pages 146-152;
12. Teuşdea, A. C., Modog, T., Mancia A., Drăgan Dan. 2008. *Deformations analisys with fourier correlation*. Annals of DAAAM for 2008 & Proceedins of the 19th International DAAAM Symposium, "Intelligent Manufacturing & Automation: Focus on Next Generation of Intelligent Systems and Solutions", 22-25th October, ISBN 978-3-90150-958-X (ISI Proceedings M/IT).
13. Teuşdea, A.; Modog, T.. 2008. *Fourier correlations of dam horizontal movements time series*. Journal of Electrical and Electronics Engineering, ISSN 1844 – 6035, Editura Universităţii din Oradea, Oradea, pg. 267-270
14. Teusdea, A.C. & Gabor, G. 2009. *Iris Recognition with Phase-Only Correlation*. Annals of DAAAM for 2009 & Proceedings of the 20th International DAAAM Symposium, ISBN 978-3-901509-68-1, ISSN 1726-9679, pp 690-691, Editor B. Katalinic, Published by DAAAM International, Vienna, Austria.