RESEARCH ON THE PRODUCTION OF YOGURT SHEEP'S MILK ENRICHED IN ESSENTIAL FATTY ACIDS

Hîlma Elena , Matea Cristian T., Mierlita Daniel, Rotaru Gabriela, Constantin Bele[**]

**University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail: hilma_elena@yahoo.com*
***University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Calea Manastur, RO-400372, Cluj, Romania, e-mail:mateatcristian@gmail.com*

Abstract
Products sour milk are beneficial to human body due to live bacteria that contain lactic acid. Made from sheep's milk, the fat composition to increase the biological value of the fatty acid composition with a small number of carbon atoms and unsaturated fatty acids in relatively higher percentage than in the milk of other animal species. Addition of fish oil is intended to enrich food and im Ω3 Ω6 essential fatty acids.Fatty acids were analyzed by gas chromatography (GC) with flame ionization detection (FID), a Shimadzu GC-17A series gas-chromatograph, equipped with a 30m polyethylene glycol coated column (Alltech AT-WAX, 0.25mm I.D., 0.25µm film thickness). Ados fish oil 0.05% 0.10% .0.15% for raw milk, 3 sets of 5 samples of yogurt and 3 series sana 5 samples with added fish oil gradually. They obtained the following average values: primăPUFA material milk-4.37, 4.42, 4.82, 5.4, for iaurtPUFA-4.42, 4.77, 4.96 5.9. It was found that in the process losses are not significant.

Keywords: essential fatty acids sheep milk yogurt

INTRODUCTION

Sheep and goat milk proteins are also important sources of bioactive angiotensin converting enzyme (ACE) inhibitory peptides and antihypertensive peptides. (Y.W. Park et all, 2007) It has been concluded that among free-grazing animals, when the forage is in the vegetative phase, the CLA content of the milk increases, but when the same forage is in the reproductive phase, the CLA falls considerably .(M.R. Sanz Sampelayo et all, 2007) That feeding factors have the main effect on CLA production which can be used in practice on the field to increase the CLA.(E. Tsiplakouat et all,2006).Sour milk fermentation conditions (inoculum level at 4%, initial pH of medium at 7.5 and fermentation temperature at 39.0 C) were optimized using RSM to obtain ACE-inhibitory activity peptides. (Daodong Pan et all, 2010) This fermented milk whey product inhibited ACE invitro.The bioactivity was contributed mainly by peptide of Tyr-Pro-Tyr-Tyr which remained without being further hydrolyzed during in vitro gastrointestinal digestion. (Jenn-Shou Tsai et all, 2008) In order to find new application fields for probiotics and their fermented products, explored fermented milks cultured with various probiotic strains improving amyloid

precursor protein (APP) metabolism in Alzheimer's disease. (Seung-Woo Yeon*et all, 2010). Human breast milk is a complex mixture of organic and inorganic compounds. Some compounds,such as conjugated linoleic acid (CLA), come partly from the mother's diet and are produced by themother's body and secreted into the milk. (Athena A.et all, 2008) Fish oils have many dietary benefits, but have strong odours and are easily oxidised. For these reasons, bcyclodextrin(b-CD) a water-soluble polymer and polycaprolactone (PCL) a water-insoluble polymer wereused to encapsulate fish oil. (Mi-Jung Choi et all,2010.) Fish oil is a rich source of ω-3 fatty acids (FAs), especially eicosapentaenoic acid and docosahexaenoic acid. For individuals with a low fish intake, a dairy product fortified with fish oil may be a useful vehicle for ensuring adequateintake of omega-3 LC PUFA(Wojciech Kolanowskia et all 2007). In this case, seeking to enhance the biological value of sheep's milk yogurt with added fish oil and keeping quality and storage period by incorporating fish oil fatty molecule by homogenization and pasteurization.

MATERIAL AND METODS

Process Technology:-Description of technological process:
Reception quality: Sheep milk-fat features.i following: - 6.1%, protein substances: - 4.5%, lactose: -6.3%, fat-free basis: -11.7;
Quantitative Front: -25 l sheep milk
Cleanup: centrifugal ,filtration and purification
Addition of fish oil: added to fish oil was purchased from SC EXPORT-IMPORT Hofigal S.A. It presents in capsule form. A coated capsule contains 400.00 mg. fish oil is not high in essential fatty acids (Omega 3: EPA, eicosapentaenoic acid, docosahexaenoic aicd DHA and Omega-6: linoleic acid) and excipients (aerosil, hydroxypropylmethylcellulose, gum arabic, fructose, magnesium carbonate, gluconate delta lactones , polivnilpirolidonă K, talk, vanillin) to 431.00 mg.A fish oil was added in increasing proportions of potting process to determine its fat molecules in milk of sheep by homogenization and milk composition is enriched in developing Essential fatty acids during pasteurization and preparation for manufacture. It focuses on both the development of essential fatty acids concentration during the technological process and organoleptic characteristics of the particular taste and added aromă.Sa 30, 60 and 90 fish oil capsules corresponding percentages: 0.05%, 0.10% and 0.15%. The capsules were dissolved in sheep's milk to 60 degrees C and embedded in raw milk followed by homogenization, pasteurization.

Homogenisation:-the three-stage homogenizer
Pasteurization: device-plate pasteurization regimes:-T:-85 °C;t -30 min
Cooling:-yogurt: -48 º C,
Sowing:-yogurt: Cristian Hansen-type lactic culture YC 11,
Thermostatic:-yogurt - T: 45 ÷ 40 ° C, t: 4 h
Pre-cooling:-T: 23 º C, t: 30 min
Cooling:-T: 4 ÷ 8 ° C: t: 10 h

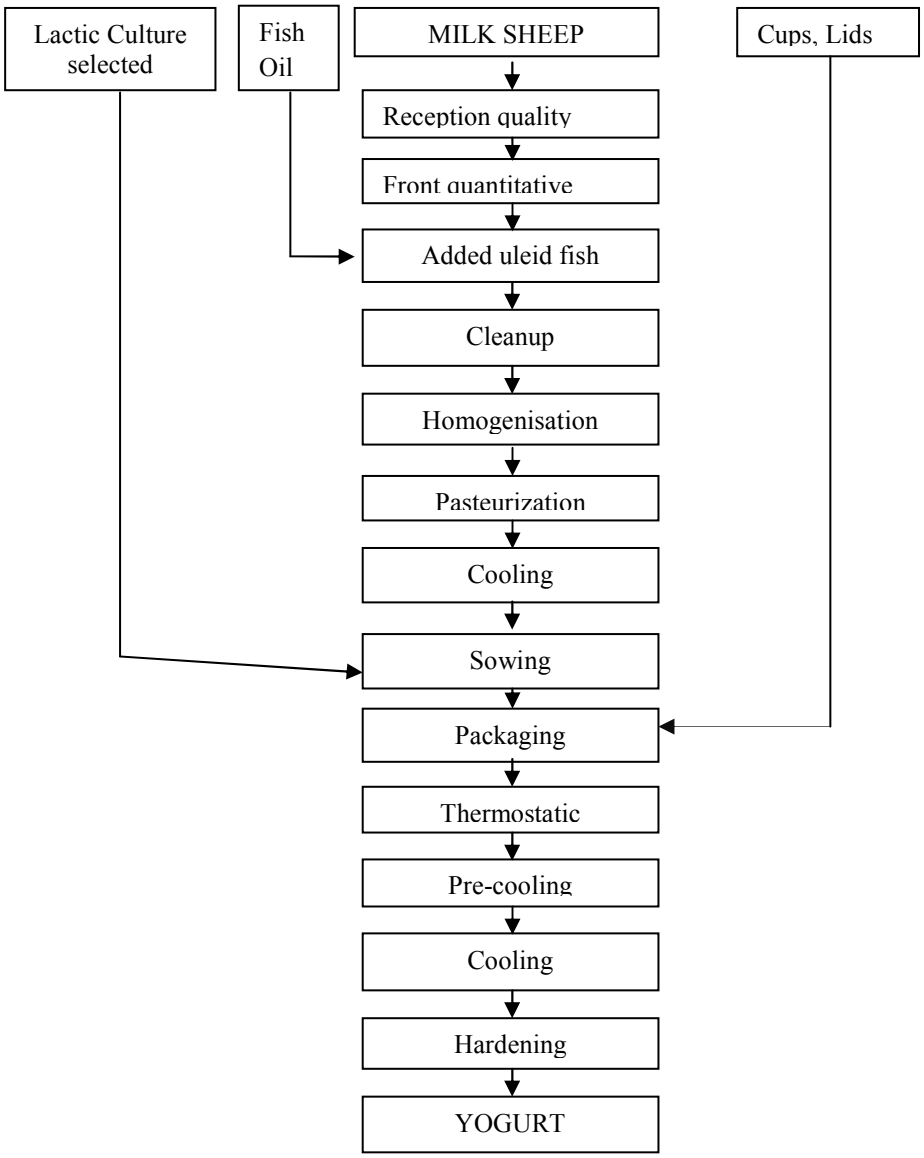

Fig. 1 The technological scheme of production of yoghurt from sheep's milk with adde

Gas-chromatographic analysis of fatty acids:

Milk fat was extracted by using the following protocol: About 1ml of milk samples were mixed with 0,6 ml ammonia 25%, 2ml EtOH, 4ml Ethyl ether and 4 ml hexane and then agitated for 2-3min. After this process the lower layer (the ammonia layer) was discarded. Following this step the mixture was passed through a cellulose filter with Na2So4 and then brought to dryness.

Transesterification::Fatty acids were converted to methyl esters by reaction with boron trifluoride/methanol at 80ºC for two hours in a closed Pyrex glass tube. The content was transfered into a separatory funell.

The methyl ester extraction:The extraction was made using 10 ml hexane. The hexanic fractions collected were dried using anhydrous sodium sulfate, filtered, concentrated under a nitrogen stream and finally re-eluted in 1 mL hexane. Fatty acids were analyzed by gas chromatography (GC) with flame ionization detection (FID). A 1µL sample was injected into the Shimadzu GC-17A series gas-chromatograph, equipped with a 30m polyethylene glycol coated column (Alltech AT-WAX, 0.25mm I.D., 0.25µm film thickness). Helium was used as the carrier gas at a pressure of 147 kPa. The injector and detector temperatures were set at 260ºC. For the oven temperature the following program was used: 70ºC for 2 min. then raised to 150ºC at 10ºC/ min. rate and held at 150ºC for 3min., then further raised up to 235ºC at a 4ºC/min.

Fatty acids were analyzed by gas chromatography (GC) with flame ionization detection (FID). A 1µL sample was injected into the Shimadzu GC-17A series gas-chromatograph, equipped with a 30m polyethylene glycol coated column (Alltech AT-WAX, 0.25mm I.D., 0.25µm film thickness). Helium was used as the carrier gas at a pressure of 147 kPa. The injector and detector temperatures were set at 260ºC. For the oven temperature the following programe was used: 70ºC for 2 min. then raised to 150ºC at 10ºC/ min. rate and held at 150ºC for 3min., then further raised up to 235ºC at a 4ºC/min.

RESULTS AND DISCUSSION

Analysis by flow technology

Organoleptic tests were made with methods of analysis by Valentina A. Guzun. Physico-chemical analysis by flow technolog: Acidity determination Törner method by G. Chintescu et all, 1982, ; fat percentage determination Gerber method by Centrala Industrializării laptelui. 1984 Standarde se stat şi metode de analiză.C.O.C.P.C.I.A. Bucureşti. Analysis of

finished product: yogurt: 104 º T-acidity ÷ 110 ° T fat percentage: 7.0% - 6.5% .

Results of organoleptic and physical-chemical analysis are presented in Table 1. Physico-chemical Parameters are normal. Taste products were analyzed for three weeks by 5 people. Yogurt made slightly sour refreshing taste. Product taste and aroma are affected as fish oil taste and characteristic odor prints. This disadvantage is reduced by long-term high-pasteurized. Temperature-85 ° C for-30 min. in pond. The taste of fish oil found at a concentration of 0.1% is barely perceptible and the concentration 0.15is perceptible fish taste. By maintaining the temperature of refrigerated fish taste and flavor disappears as: -3 days in products containing 0.1% fish oil, 7 days 0.15% products with added fish oil. (table 1)Sheep's milk is pasteurized at high temperatures exacerbated by diacetyl flavor and aroma that is transmitted and products. Consistency is a good characteristic of yogurt from sheep's milk products focused on the dry weight. Glassy, without removal of whey.

Fatty acid analysis shows a higher amount of saturated fatty acids with low carbon and essential fatty acids in raw milk.

The concentration of fatty acids esnțiali yogurt increases the amount of fish oil added to milk sheep. that during the technological process have been loss of essential fatty acids.(table 2, 3).

Table 1

Physico-chemical parameters on flow technology and finished product: YOGURT

assortment	Sheep milk								sowing		thermostatic			finished product		
	Fat %	A°T	pH	D20°C g/l	non-fat substance %	protein substance %	lactose %	Peroxidase test	T °C	lactic culture	T °C	t h	A °T	Gr %	A °T	organo-examination leptc
Yogurt 0	6.10	21	6.67	1032.5	11.7	4.5	6.3	negative	49	YCX 11	42	4	70	6.10	100	normal
Yogurt 0,05	6.15	21	6.65	1032.5	11.9	4.5	6.3	negative	49	YCX 11	42	4	72	6.15	98	normal
Yogurt 0,10	6.20	22	6.67	1032.7	11.7	4.7	6.5	negative	48	YCX 11	43	4	68	6.20	104	normal
Yogurt o,i5	6,25	21	6.67	1032.5	11.9	4.5	6.3	negative	48	YCX 11	43	4	68	6.25	102	normal

Gas-chromatographic analysis

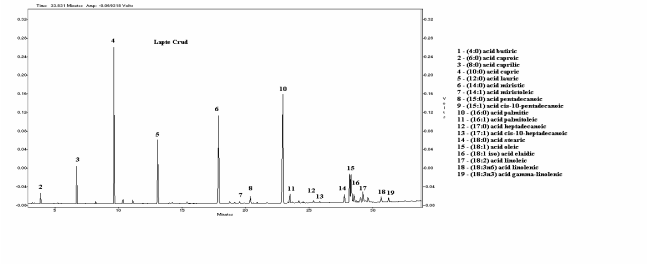

Fig. 2 The concentration of fatty acids from raw milk

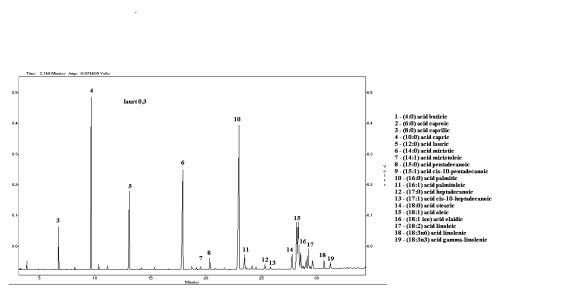

Fig. 3 The concentration of fatty acids acids from yogurt

Table 2

Percentage of fatty acids in YOGURT

Fatty Acid	Abreviation	Sheep milk				yogurt		
		raw milk	pasteurized milk			0,05%	0.10%	0,15%
			0,05 %	0,10%	0,15%			
Butyric	4:0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Caproic	6:0	0.88	0.31	0.67	n.d.	n.d.	n.d.	n.d.
Caprilic	8:0	3.05	2.24	2.51	1.84	2.24	2.07	2.28
Capric	10:0	14.00	11.71	11.45	10.96	11.26	11.32	11.24
Lauric	12:0	8.91	7.76	7.55	7.30	7.68	7.78	7.35
Miristic	14:0	14.97	14.12	13.80	13.83	14.15	14.43	13.58
Miristoleic	14:1	0.34	0.31	0.32	0.36	0.36	0.29	0.32
Pentadecanoic	15:0	1.22	1.21	1.19	1.25	1.22	1.27	1.19
Cis-10-pentadecanoic	15:1	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Palmitic	16:0	24.99	25.52	25.14	26.20	25.84	26.05	25.32
Palmitoleic	16:1	1.71	1.63	1.77	1.65	1.79	1.68	1.65
Heptadecanoic	17:0	0.45	0.52	0.50	0.54	0.51	0.53	0.52
Cis-10-heptadecanoic	17:1	0.32	0.33	0.33	0.34	0.34	0.34	0.34
Stearic	18:0	1.69	2.33	2.07	2.75	2.14	2.66	2.41
Oleic	18:1	14.45	17.03	17.04	17.65	17.18	17.02	17.54
Elaidic	18:1iso	1.78	2.22	2.17	2.16	2.16	0.39	2.27
Linoleic	18:2	2.55	2.68	2.75	3.01	2.64	2.83	2.88
Linolenic	18:3n6	0.97	1.00	1.10	1.06	1.00	1.07	1.15
γ-Linolenic	18:3n3	0.84	0.72	0.96	0.96	0.76	0.85	1.05

Table 3

Percentage of fatty acid groups in YOGURT

Fatty acid groups	Sheep milk				yogurt		
	Raw milk	pasteurized milk			0,05%	0,10%	0,15%
		0,05%	0,10%	0,15%			
S.F.A.	69.30	65.75	64.92	64.72	65.08	64.65	64.63
M.U.F.A.	18.30	21.21	21.32	21.83	21.50	21.54	22.67
P.U.F.A.	4.37	4.42	4.82	5.04	4.42	4.96	5.11

n.d. – not detected

S.F.A. – Saturated Fatty Acids (Acizi Grasi Saturati)

M.U.F.A. – Mono Unsaturated Fatty Acids (Acizi Grasi Mono-nesaturati)

P.U.F.A. – Poly Unsaturated Fatty Acids (Acizi Grasi Poli-nesaturati)

CONCLUSION

The consumption of sheep's milk yoghurt enriched in essential fatty acids by adding fish oil to provide about 25% of required daily intake for humans if consumed 200 grams. yoghurt with 0.15% fish oil.

This product has the advantage that is embedded in products with live lactic acid bacteria with good effect on the intestinal tract is easy and completely assimilated by the human body young, old, healthy or sick.ListenRead phonetically

ACKNOWLEDGEMENTS

This work was supported by CNCSIS–UEFISCSU, project number PNII–IDEI, ID-679/2008, number 1082/2009.

REFERENCES

1. Athena A. Moutsioulisa, Daniel C. Ruleb, Charles M. Murrietab, Dale E. Baumanc,, Adam L. Lockd, David M. Barbanoe, Gale B. Careya, Nutrition Research 28 (2008) 437–442 ,Human breast milk enrichment in conjugated linoleic acid after consumption of a conjugated linoleic acid–rich food product:a pilot study .
2. Centrala Industrializării laptelui. 1984 Standarde se stat şi metode de analiză.C.O.C.P.C.I.A. Bucureşti.
3. Chintescu, G., Grigore, Ş. 1982. Îndrumător pentru tehnologia produselor lactate.Editura tehnică, Bucureşti.
4. Costin, G. M., Bahrim, G., Borda, D., Curic, M., Florea, T., Hansen, K. F., Popa, C., Rotaru, G., Segal, R., Skriver, A., Stanciu, S. 2005. Produse lactate fermentate.Ed. Academica, Galaţi.
5. Costin, G. M., Caşulschi, T., Pop, D. M., Stanciu, S., Paraschiv, D. 2007. Produse lactate funcţionale. Ed. Academica, Galaţi.
6. Daodong Pan a,b,*, Yuxing Guo b, International Dairy Journal 20 (2010) 472e479, Optimization of sour milk fermentation for the production of ACE-inhibitory peptides and purification of a novel peptide from whey protein hydrolysate.
7. Guzun, V., A. 1998. Tehnologia laptelui şi a produselor lactate. Lucrări practice şi de laborator. Ed. Civitas, Chişinău.
8. Jenn-Shou Tsai a,*, Tai-Jung Chen a, Bonnie Sun Pan a, Shein-Da Gong b, Mei-Yuh Chung b Food Chemistry 106 (2008) 552–558, Antihypertensive effect of bioactive peptides produced by protease-facilitated lactic acid fermentation of milk.
9. Seung-Woo Yeon*, Young Sang You1, Hyuk-Sang Kwon2, Eun Hee Yang3, Jung-Su Ryu4,Byung Hwa Kang5, Jae-Hoon Kang6. Journal of functional foods 2 (2 0 1 0) 1 4 3 –1 5 2. Fermented milk of Lactobacillus helveticus IDCC3801 reducesbeta-amyloid and attenuates memory deficit.
10. Tsiplakou E. , Mountzouris K.C., Zervas G. Livestock Science 105 (2006) 162–167 The effect of breed, stage of lactation and parity on sheep milk fat CLA content under the same feeding practices
11. Wojciech Kolanowskia,_, Jenny WeiXbrodt. International Dairy Journal 17 (2007) 1248–1253. Sensory quality of dairy products fortified with fish oil.