BIOLOGICAL VALUE OF SHEEP MILK BASED ON THE TYPE OF FOOD

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Abstract. *In this research study we have analyzed the quality of sheep's milk depending on the food. It has been taken into consideration the milk provided by pasture-fed sheep and hill fertilized lowland pasture, soil podzolic. The breed of sheep is Turcan. There have been studied the chemical characteristics of milk and,* and, *in order to establish the compared biological value between the two alternatives, milk'fat acids composition has been analyzed. Fat acid'concentration has been performed by means of gas chromatography. There have been determined 19 saturated, monounsaturated and polyunsaturated fat acids. Due to the importance of the essential fat acids, it has been particularily studied their evolution, being obtained the following values Milk provided by sheep fed on unfertilized pasture hill: linoleic acid (ω6); acdlinoleic (ω3) γlinolenic acid (ω6), while the milk provided by sheep fed on lowland pasture: linoleic acid (ω6) -1.85; linolenic acid (ω3) -0.98 γlinolenic acid (ω6) -1.63 and lowland pasture, podzolic soil: acid linoleic (ω6) -2.29; linolenic acid (ω3) -1.19 γlinolenic acid (ω6) -1.25*

Keywords: hills, plains, sheep milk, fat acids

INTRODUCTION

Sheep'milk is widely used in human nutrition due to the exquisit taste of the products as compared to those obtained from the goat'milk, but also due to the fact that it is easily assimilated by the body.

The percentage of the protein may increase by the enrichment of the food with proteic substances or aminoacids, thus obtaining increased values of urea, but with no effect on specific consumption when processing cheese specialities, increasing, though the nutritious value of the acid milk products. (Giuseppe Pulina and others, 2006)

Another reason for which sheep milk is considered to be healthy is the high level of orotic acid. Orotic acid compounds have antitumour activity (JL Butour and others, 1997). Orotic acid is associated with potential liver cell recovery and prevention of liver lipolytic effect. It also helps in reducing the adipose tissue. (Adaliene Versiani Matos Ferreira and others, 2008).

In order to assess the effect on the volatile fraction of the milk and cheese by introducing into the pasture the Chrysanthemum coronarium (Asteracea), a research study has been performed . It had significantly influenced the volatile substances fraction in milk and cheese, mainly due to the presence of theterpenic hydrocarbons that have passed directly from the grass into the milk and milk products. As a conclussion, coronarium Chrysanthemum (daisy) imprint the cheese with a maturated taste and smell. (M. Addis, 2006).

The diet enriched by sunflower seeds lead to a decrease of the saturated fat acids and to an increase of the polyunsaturated fat acids concentration by a long chain of carbon atoms beneficial to human health. (R. H. Zhang, 2006)

The concentration of CLA1 in the milk has increased as a response to the change from hey to green pasture, being followed by a decline due to te maturation of the pasture and, due to a more advanced lactation stage. CLA2 has been detected only in the case of sheep fed on pastures and not in case of goats fed with hey, indoors. (E. Tsiplakou, 2006). The concentration of CLA in milk may increase by 5÷7 times by increasing the content of linoleic acid of ruminant' food by duodenal infusion or feeding with sunflower meal. Spectacular results were obtained enriching sheep'food with tomatoes. Thus, after 6 weeks, the content of CLA has increased by 19,8% and PUFA by 13% while the fat acids concentration and the level of colesterol have decreased. (Raffaele Romano, 2010)

MATERIAL AND METHOD

Sheep'milk fed on: natural, hill pasture, with no fertiliser, 120 sheep Turcana breed and podzolic soil fertilized pastures, 350 Turcana sheep.

Table 1

Coding of the samples

Sheep milk	Code
Unfertilized pasture hill, Turcan	D
Lowland pasture, podzolic soil, unfertilized , Turcan	P

For physical – chemical analysis standard methods have been used.

- determination of titratable acidity acidity-method: - SR ISO 6091/2008; determination of fat content - STAS 6352/1-88; determining the density of milk - STAS 6347-89.

Physical – chemical determinations have been also performed electronically, using LactoStar L which determines % fat; % protein; % lactose; % low-fat dry substance ;freezing point and Ekomilk which determines % fat, density % low-fat dry substance; % proteins; freezing point; % added water.

Analysis of fat acids using the gas-chromatographic method:- Weigh 1 ml. of sheep milk sample and break it up with 10 ml distilled water. 1 ml of dilution obtained were mixed with 0,6 ml ammonia 25%, 2ml EtOH, 4ml Ethyl ether and 4 ml hexane and then stirred for 2-3min. Then, the lower layer (the ammonia layer) was discarded. Following this step the mixture passed through a cellulose filter with Na2S04 and then dried.

Transesterification::Fat acids were converted to methyl esters following the 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. Fat 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 increased to 150ºC at 10ºC/ min. rate and held at 150ºC for 3min., then increased further to 235ºC at a 4ºC/min. Fat 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 a 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 increased to 150ºC at 10ºC/ min. rate and maintained at 150ºC for 3min., then further increased up to 235ºC at a 4ºC/min.

RESULTS AND DISCUSSION

In what the analyzed samples are concerned, it has been noticed that the highest percentage of fat in the milk is the one provided by Turcan sheep fed on an unfertilised, hill pasture, by 5,5 times higher that the milk provided on prodzolic soil; In what the analyzed samples are concerned, it has been noticed that the highest percentage of fat in the milk is the one provided by Turcan sheep fed on an unfertilised, hill pasture, by 5,5 times higher that the milk provided on prodzolic soil; concentration in low-fat dry substance is 3,2% higher in case of sheep that have been fed on a hilly unfertilised pasture,than in case of sheep fed on prodzolic soil; a higher percentage of protein is to be found in sheep fed on a hilly, unfertilised pasture , 3,2% higher in case of sheep procent mai mare de proteină se găseşte în laptele de la oi din rasa hrânite pe păşune de deal nefertilizată, cu 3,2% fed on prodzolic soil;lactose concentration is 3,2% higher in case of the milk provided by sheep fed on unfertilised, hilly pasture, than the milk obtained from sheep fed on lowland pastures, prodzolic soil.

These results are shown in Table 2 and presented graphically in figure 1.

Table 2

Physico-chemical characteristics of sheep milk

Code	acidity		[illegible]	Lac tose %	Freez ing point ° C
	°Sh	°T			
D	10	25	7[illegible]	[illegible],59	–0.706
P	9	22	6[illegible]	[illegible],38	–0.681

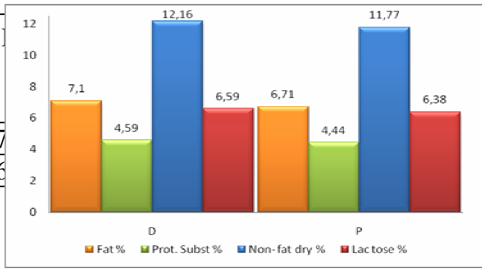

Fig. 1. Evolution of sheep milk concentration

The concentration of fat acids in case of the studied samples of milk progresses as follows: the concentration of lauric acid is 19%higher in case of milk in sample D, than the concentration found in sample P; miristic acid is 18% higher in sample D as compared to sample P , the concentration of pentadecanoic acis as well as of heptadecanoic acid is very small as compared to the other saturated fat acids, to such extent that they do not influence the biologic value of the sheep milk; paltimic acid has the highest percentual values in the total of fat acids; stearic acid reduces to half as compared to paltimic acid, which increases the biological value of the milk; this is good as this acid is difficult to be assimilated by the human body due to the colesterol levels and to the negative impact on health. In case of the samples that have been studied, the presence of the stearic acid is as follows: the highest percentage is to be found in sample P, by 14,2% higher than the one found in sample D.

Table 3

Concentration in sheep milk fat acids analysis

Fatty Acid	Abreviation	D	P
Butiric	4:0	[illegible]	[illegible]
Caproic	6:0	[illegible]	[illegible]
Caprilic	8:0	[illegible]	[illegible]
Capric	10:0	[illegible]	[illegible]
Lauric	12:0	[illegible]	[illegible]
Myristic	14:0	[illegible]	[illegible]
Myristoleic	14:1	[illegible]	[illegible]
Pentadecanoic	15:0	[illegible]	[illegible]
Cis-10-pentadecanoic	15:1	[illegible]	[illegible]

Palmitic	16:0	23,71	22,00
Palmitoleic	16:1	[illegible]	[illegible]
Heptadecanoic	17:0	[illegible]	[illegible]
Cis-10-heptadecanoic	17:1	[illegible]	[illegible]
Stearic	18:0	[illegible]	[illegible]
Oleic	18:1	[illegible]	[illegible]
Elaidic	18:1 iso	[illegible]	[illegible]
Linoleic (ω6)	18:2	[illegible]	[illegible]
Linolenic (ω3)	18:3	[illegible]	[illegible]
γ-Linolenic (ω6)	18:3	[illegible]	[illegible]

The variation of the essential fat acids is presented as follows:linoleic acid (ω6) is to be found in a higher concentration in P milk, by 23,7% than in case of D sample ; linolenic acid(ω3) is higher in case of sample P by 17,6% as compared to the total of the fat acids in sample D; γlinolenic acid, ω6 is to be found in higher percentage in case of sample Deal than in Pusta sample, by 23%.

Changes in fat acids are shown in Table 3 and presented graphically in Figure 2, 3.

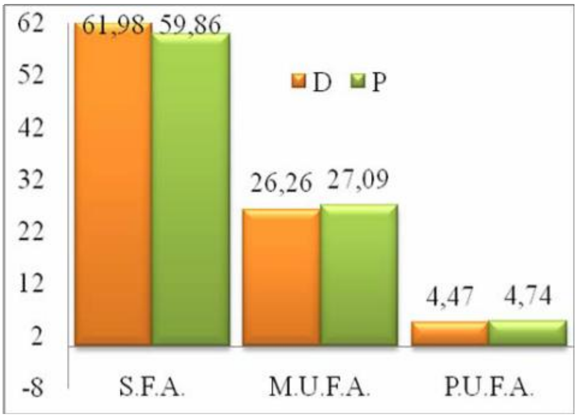

Fig. 2. Concentration of fat acids in milk by grazing sheep

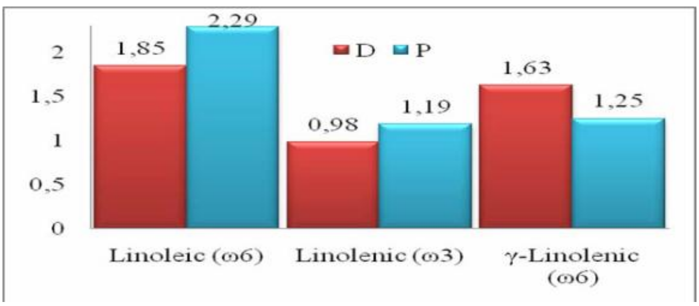

Fig. 3 Essential fat acid concentration of milk by grazing sheep

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CONCLUSIONS

It is generally observed that the concentration of sheep milk fatty acid molecule is less (C4-10) for the pasture than in hilly lowland pasture. From tis point of view we may consider a superior biological value of the milk provided from sheep fed on a lowland pasture, as short-chain fat acids are easier to be absorbed by the human body. As for the saturated fat acids with C_{12-20} , their value is higher in lowland area, which determine the biological value of the milk.

The incidence of the essential fat acids is superior in lowland areas. If we consider the concentration of essential fat acids that are the most important for the human body, the quality of the milk provided by sheep fed in lowland areas, on prodzolic soil is superior as compared to the quality of the milk obtained from sheep fed on a hilly, unfertilised pasture.

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