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Fatty acid composition in kefir from milk of Bulgarian white dairy goat breed and its crossings

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An analysis was conducted on the fatty acid composition of kefir at the 24th hour of production, obtained from goat’s milk of Bulgarian White Dairy (BWD) breed and its crossings with Anglo-Nubian (AN) and Toggenburg (TG) goats during the lactation period. Saturated fatty acids (SFAs) were found to decrease in the milk in all three kefir batches with 1.93 g/ 100 g fat for BWD, with 1.84 g/ 100 g fat for BWDxTG and with 0.98 g/ 100 g fat for BWDxAN, whereas the monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs) predominated in BWD batches. The essential fatty acids, such as omega-3 and omega-6, had low values in the studied samples. The values of the lipid indices indicate a well-balanced fatty acid composition of goat's milk and the products derived from it. The atherogenic index in all three batches of kefir (2.20; 2.25; 2.47) was lower compared to the raw material (2.48; 2.54; 2.68), which defined them as healthier in terms of lipid content. The data on saturated fatty acids in the studied kefir batches at the 24th hour of production varied from 3.40 g/ 100 g product for BWD to 3.83 g/ 100 g product for BWDxTG, whence they refer to products with a high content of saturated fatty acids and low content of trans fatty acids (0.9 g/ 100 g product), according to Regulation (EC) No. 1924/2006.

Key words: goat’s milk, kefir, fatty acids, lipid indices

INTRODUCTION

Milk and milk products are one of the most consumed foods in Bulgaria. They are obtained through various fermentation technologies with the participation of lactic acid bacteria, which increases their dietary potential. The consumption of goat’s milk products is associated with beneficial health effects. Beyond its nutritional value and compared to other types of milk, goat’s milk is characterized by a high buffer capacity, digestibility, alkalinity and certain therapeutic properties related to healthy nutrition [1].

Kefir is one of the most useful products for human health in the group of fermented lactic acid foods. It is a traditional drink originating from the Caucasus region, but consumed worldwide, resulting from two fermentations with kefir grains – lactic acid and alcoholic [2]. It has all the beneficial properties of lactic acid drinks, providing the body's calcium needs, and at the same time it is a dietary lactic acid product, with high absorption, rich in many beneficial bacteria and suitable for all age groups [3]. Kefir has a smooth creamy consistency, a slightly sour taste mainly due to the presence of lactic acid and a low concentration of ethanol produced by the yeast cells present in the grains. In addition, a variety of aromatic substances, including acetaldehyde, acetoin, and diacetyl, contribute to its distinctive flavor [4]. The yeasts involved in the fermentation of kefir are important for its physicochemical and sensory characteristics and exhibit antibacterial activity against colonic flora [4]. Milk fat also plays an important role in the production of fermented beverages, as recently there has been an increasing interest in the various fatty acids from the omega-3 group and CLA, which have a significant effect on the metabolism. The possibilities for the inclusion of goat's milk as a component in products with a functional purpose are limited in nature and have not been sufficiently researched. Therefore, the aim of the present study is to produce kefir from goat’s milk of Bulgarian White Dairy (BWD) and its crossings with Toggenburg (BWDxTG) and Anglo-Nubian (BWDxAN), to determine its fatty acid composition at the 24th hour of the process of production in view of its health impact on the human body.

MATERIALS ANAD METHODS

Milk from experimental animals at the Research Institute of Mountain Stockbreeding and Agriculture - Troyan are used, that have been raised in one herd under the same production conditions consisting of three groups - 'Bulgarian White Dairy' and its crossings with 'Toggenburg' and 'Anglo-Nubian'.

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The rearing system is pasture-barn based, as in the period of April-November the animals were on a natural pasture of transitional type and in the barn, during the rest of the year. Several batches of kefir were prepared at the beginning (April), the middle (June) and the end (September) of the lactation period.

Several batches of kefir were prepared from goat's milk of these breed groups for the lactation period. For this purpose, the milk was pasteurized at a temperature of 85-90˚C, with a delay of 10-15 s., cooled to 29˚C and leavened with dry starter culture for kefir (*Lactococcus lactis* sp. lactis, *Lactococcus lactis* sp. diacetylactis, *Lactococcus lactis* sp. cremoris, *Leuconostoc mesenteroides* sp. cremoris, *Lactobacillus kefyr*.). It was poured into suitable vessels and allowed to ferment at 29˚C for 16 - 18 hours. After that, it was cooled and transferred for refrigerated storage at 0-4˚C. Samples from the kefir batches were tested to determine the content of fatty acids at the 24th hour of the production process and were presented as arithmetic mean. Based on the obtained fatty acid composition, the following indices were calculated:

1) Atherogenic index (AI) - calculated based on the content of medium-long fatty acids - C12:0, C14:0 and C16:0 and the groups of monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs) [5]:

$$AI = \frac{C12:0 + 4 \times C14:0 + C16:0}{MUFAs + PUFAs}$$

2) Thrombogenic index (TI) according to Ulbricht and Southgate [6]:

TI=(C14:0+C16:0+C18:0)/0.5xΣC18:1+0.5xΣMUFAs+0.5xΣPUFAn6+3xPUFAn−3+(PUFn3/PUFAn6)

3) Lipid preventive score (LPS) according to the equation of Richard and Charbonnier [7]:

LPS = TL + 2xSFAs- MUFAs – 0.5xPUFAs,

where: LPS is lipid preventive score;

TL - total lipids;

SFAs - saturated fatty acids;

MUFAs - monounsaturated fatty acids;

PUFAs - polyunsaturated fatty acids.

4) Ratio between hyper and hypocholesterolemic fatty acids (h/H):

h/H=(C18:1n-9+C18:1n-7+C18:2n-6+C18:3n-3+C18:3n-6+C20:3n-6+C20:4n-6+C20:5n-3+C22:4n-6+C22:5n-3+C22:6n-3)/(C14:0+C16:0).

Variational statistical processing of the data was conducted by the Statistica software package.

RESULTS AND DISCUSSION

Milk fat has a significant impact on the biological and nutritional value of milk and the taste qualities of the produced dairy products.

The content of saturated fatty acids in milk and kefir at the 24th hour showed no significant differences between the three groups of goats (Table 1), with the highest amounts being found for C-16:0, followed by C-18:0, C -10:0 and C-14:0.

The levels of lauric (C-12:0), myristic (C-14:0) and palmitic (C-16:0) fatty acids were decreased in milk in all three kefir batches, suggesting a better health effect of the product. Higher results were obtained by Nacheva *et al.* [8] for stearic acid (C-18:0), which increased in the present research work by 0.43g/100g fat in BWD kefir, by 0.22 g/100g fat in BWDxTG and by 0.40 g/100g fat in BWDxAN compared to the original raw material.

A high content of short-chain fatty acids in the diet leads to an increase in the level of LDL-cholesterol in the blood and to an increase in the risk of cardiovascular diseases in humans [9, 10]. Their amount in the milk of the groups studied by us varies from 18.70% (BWD) to 22.39% (BWDxAN).

Of the monounsaturated fatty acids (Table 2), the spectrum of cis- and trans-isomers of C-18:1 is the most diverse, with oleic (C-18:1c9) and vaccenic acids (C-18:1t11) predominating, and the remaining cis- and trans-forms of oleic acid are in concentrations lower than 1%. The highest content of both acids was found in kefir from the BWD breed - 23.01 g/ 100 g fat, 0.89 g/ 100 g fat, whereas the lowest was in BWDxTG - 21.45 and 0.78 g/ 100 g fat, as their concentration in the milk kefir rose slightly. The presence of all trans isomers, with the exception of trans-vaccenic acid (C-18:1t11), are considered "undesirable" due to their varying degrees of carcinogenicity [11]. The significance of this acid (C-18:1t11) is due to its role also as a precursor in the synthesis of the major isomer of the nutritionally valuable conjugated linoleic acid (CLA), namely cis-9 trans-11 C-18:2, which takes place in the mammary gland [12].

Table 1. Saturated fatty acids, g/ 100 g fat, (n=9)

Fatty acids	Breed groups					
	BWD		BWDxTG		BWDxAN	
	x±Sx		x±Sx		x±Sx	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
C-4:0	3.23±0.002	3.29±0.014	3.29±0.005	3.68±0.122	4.02±0.016	4.27±0.013
C-6:0	2.87±0.234	2.69±0.231	3.63±0.321	3.28±0.212	3.77±0.123	3.72±0.010
C-7:0	0.02±0.003	0.01±0.004	0.02±0.003	0.01±0.005	0.02±0.004	0.01±0.002
C-8:0	2.99±0.213	2.72±0.218	3.66±0.132	3.27±0.132	3.70±0.234	3.57±0.201
C-9:0	0.04±0.142	0.03±0.421	0.03±0.198	0.07±0.212	0.04±0.010	0.04±0.205
C-10:0	9.55±0.403a*	9.04±0.342	10.70±0.531a*	10.14±0.345	10.84±0.416	10.26±0.403
C-11:0	0.07±0.05	0.04±0.006	0.05±003	0.07±0.005	0.05±0.001	0.06±0.004
C-12:0	4.41±0.198	3.84±0.209	4.53±0.563	4.26±0.305	4.23±0.431	4.17±0.324
C-13:0	0.08±0.065	0.07±0.403	0.06±0.432	0.07±0.236	0.06±0.631	0.06±0.457
C-14:0	9.82±0.132	9.42±0.412	10.20±0.221	9.95±0.642	9.13±0.301	9.02±0.290
C-15:0	0.08±0.076	0.07±0.062	0.09±0.068	0.06±0.078	0.07±0.074	0.04±0.054
C-16:0	27. 72±1.234	27.15±1.234	27.69±1.096	27.24±1.064	27.21±1.079	27.12±1.127
C-17:0	0.62±0.032	0.72±0.045	0.57±0.076	0.52±0.031	0.58±0.065	0.056±0.098
C-18.0	12.55±1.678	12.98±1.423	12.83±1.423	13.05±1.076	12.87±1.68	13.27±0.067
C-20:0	0.10±0.016	0.09±0.042	0.04±0.035	0.07±0.043	0.06±0.023	0.04±0.056
C-21:0	0.02±0.036	0.14±0.087	0.08±0.076	0.03±0.065	0.04±0.043	0.02±0.211
C-22:0	0.05±0.009	0.01±0.003	0.03±0.076	0.01±0.043	0.02±0.022	-
C-23:0	-	-	0.01±0.006	0.01±0.312	0.01±0.067	0.01±0.312
C-24:0	0.01±0.009	0.02±0.017	0.02±0.004	0.01±0.010	0.01±0.012	0.01±0.002
C-25:0	0.01±0.15	-	0.02±0.009	0.01±0.017	0.01±0.018	0.01±0.010
C-26:0	0.02±0.019	0.01±0.013	0.01±0.016	-	0.02±0.006	0.01±0.010

Note: a- BWD/BWDxTG; *P<0.05

Polyunsaturated fatty acids in the studied samples (Table 3) have low values with the exception of linoleic and α-linolenic acid.

C18:2c9,12/19:0 ranges from 2.22 g/100 g of fat in kefir from BWDxAN to 2.98 g/100 g of fat in kefir from BWD, whereas C-18:3n3 from 0.52 g/100 g of fat in BWDxTG up to 0.56 g/ 100 g of fat in BWD kefir. The values of linoleic (C-18:2) and linolenic (C-18:3) acids in milk fat depend on the nutrition of the animals, since they are not synthesized in the organism and their absence causes a number of biological disorders [13] Differences for C-18:3n6 are minimal between breeds, from 0.12 g/ 100 g fat in BWD to 0.18 g/ 100 g fat in BWDxAN,

The content of CLA in milk and the mechanisms of impact of individual isomers have been investigated by many authors (Bauman, [14], An *et al*. [15], Schroeder *et al*. [16]). According to Jahreis *et al*. [17] CLA values in milk from different animal species are closely related to feeding regime and ration composition. Relatively low amounts of CLA isomers, some of which are trace amounts, are found in goat's milk and the investigated kefirs. The biologically active isomer C-18:2 cis-9, trans-11 (CLA9c,11t), which occupies 80% of the total amount of CLA [18] has the highest content in kefir of BWD breed with 0.47%, whereas the lowest is registered for BWDxTG with 0.37%, as an increase was observed in all three batches compared to the original raw material.

The content of branched-chain saturated fatty acids in the studied samples was low (Table 4), but they are of great interest regarding their potential role as non-invasive biomarkers of rumen function, since their variations in milk may reflect changes in bacterial populations induced by dietary ration composition [19].

The data for the main groups of fatty acids (Table 5) indicate that the levels of SFAs, MUFAs and PUFAs in kefir at the 24th hour do not differ significantly compared to the original goat's milk. A high content of SFAs was found from 72.34 g/100 g of fat in kefir from BWD to 75.81% in BWDxTG. The amount of MUFAs and PUFAs in the product increases by 1.07 respectively; 0.10 g/ 100 g fat for BWD, 1.14; 0.21 g/ 100 g fat for BWDxTG and with 1.86; 0.61 g/ 100 g fat for BWDxAN. Results close to the present were obtained by Wojtowski *et al*. [20] for kefir from goat's milk of a Polish White Goat.

Table 2. Monounsaturated fatty acids, g/ 100 g fat, (n=9)

Fatty acids	Breed groups					
	BWD		BWDxTG		BWDxAN	
	x±Sx		x±Sx		x±Sx	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
C-10:1	0.21±0.024	0.19±0.043	0.18±0.065	0.16±0.021	0.19±0.015	0.15±0.022
C-12:1n1	0.09±0.004	0.03±0.002	0.06±0.004	0.03±0.006	0.07±0.002	0.05±0.001
C-14:1n5	0.07±0.015	0.08±0.013	0.04±0.018	0.05±0.023	0.05±0.0043	0.04±0.075
C-15:1n5	0.02±0.007	0.01±0.012	0.02±0.008	0.06±0.012	0.02±0.004	0.02±0.03
C-16:19tr	0.30±0.022	0.29±0.018	0.34±0.054	0.30±0.012	0.32±0.076	0.22±0.021
C-16:1n7	0.47±0.059	0.58±0.021	0.49±0.033	0.57±0.044	0.52±0.076	0.59±0.014
C-16:2n4	0.01±0.002	-	0.01±0.002	0.01±0.032	0.01±0.021	-
C-17:1n7	0.26±0.016	0.28±0.021	0.24±0.005	0.27±0.043	0.17±0.034	0.17±0.020
C-16:3n4	0.01±0.002	0.01±0.002	0.02±0.003	0.01±0.002	0.01±0.003	0
C-18:1t4	0.06±0.001	0.15±0.003	0.07±0.002	0.18±0.002	0.18±0.001	0.25±0.003
C-18:1t5/6/7	0.16±0.102	0.18±0.038	0.14±0.056	0.17±0.078	0.17±0.013	0.19±0.015
C-18:1t9	0.22±0.043	0.25±0.034	0.24±0.054	0.26±0.098	0.21±0.065	0.24±0.010
C-18:1t10	0.20±0.015	0.28±0.065	0.19±0.170	0.22±0.016	0.17±0.012	0.23±0.013
C-18:1t11	0.84±0.208	0.89±0.140	0.76±0.130	0.78±0.234	0.73±0.134	0.78±0.127
C-18:1c9/C-18:1t12/13/	22.30±0.765	23.01±0.543a*	20.34±0.634	21.45±0.876a*	20.21±0.875	21.91±0.976
C-18:1t15	0.11±0.012	0.27±0.014	0.25±0.089	0.28±0.064	0.19±0.014	0.23±0.026
C-18:1c12	0.03±0.005	0.04±0.007	0.05±0.006	0.06±0.005	0.05±0.007	0.06±0.004
C-18:1c13	0.09±0.007	0.03±0.002	0.10±0.009	0.08±0.006	0.08±0.006	0.06±0.003
C-18:1t16	0.04±0.012	0.03±0.010	0.03±0.012	0.03±0.014	0.03±0.013	0.03±0.012
C-18:1c14	0.03±0.014	0.02±0.007	0.04±0.003	0.03±0.005	0.04±0.002	0.04±0.006
C-18:1c15	0.07±0.010	0.05±0.007	0.05±0.006	0.03±0.004	0.04±0.006	0.02±0.004
C-20:1n9	0.01±0.004	0.02±0.003	0.01±0.002	0.02±0.003	0.01±0.002	0.02±0.003
C-22:1n11	0.04±0.004	0.02±0.003	0.02±0.004	0.01±0.003	0.03±0.004	0.02±0.003
C-22:1n9	0.02±0.012	0.02±0.013	0.03±0.014	0.01±0.015	0.01±0.007	0.01±0.016

Note: a- BWD/BWDxTG; *P<0.05

Table 3. Polyunsaturated fatty acids, g/ 100 g fat, (n=9)

Fatty acids	Breed groups					
	BWD		BWDxTG		BWDxAN	
	x±Sx		x±Sx		x±Sx	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
C-18:2t9,12	0.14±0.023	0.02±0.003	0.10±0.015	0.06 ±0.012	0.11±0.013	0.07±0.015
C-18:2c9,12/19:0	2.78±0.035	2.98±0.065	2.18±0.022	2.40±0.034	2.18±0.089	2.22±0.075
gC-18:3n6	0.09±0.015	0.12±0.013	0.14±0.018	0.16±0.017	0.16±0.018	0.18±0.003
aC-18:3n3	0.53±0.065	0.56±0.045	0.50±0.076	0.52±0.043	0.54±0.045	0.55±0.076
CLA9c,11t	0.42±0.033	0.47±0.030	0.32±0.024	0.37±0.029	0.37±0.017	0.40±0.019
CLA10t,12c	-		-		-	
C-18:4n3	-		-		-	
CLA9c,11c	0.02±0.006	0.01±0.004	0.01±0.004	0.01±0.003	0.02±0.005	0.01±0.003
CLA9t,11t	0.01±0.002	0.02±0.005	0.02±0.003	0.02±0.001	0.02±0.004	0.01±0.002
C-20:2n6	0.05±0.015	0.04±0.005	0.04±0.009	0.04±0.010	0.05±0.012	0.05±0.012
C-20:3n6	0.01±0.002	0.02±0.005	0.01±0.008	0.02±0.003	0.01±0.002	0.02±0.005
C-20:4n6	0.02±0.006	0.01±0.004	0.03±0.006	0.01±0.012	0.02±0.006	0.01±0.004
C-20:3n3	0.26±0.008	0.18±0.019	0.25±0.032	0.20±0.045	0.21±0.065	0.16±0.034
C-22:5n3	0.06±0.012	0.07±0.011	0.09±0.65	0.08±0.011	0.06±0.004	0.06±0.013
C-22:6n3	0.03±0.017	0.02±0.004	0.02±0.013	0.01±0.004	0.02±0.014	0.02±0.002

Table 4. Branched fatty acids, g/ 100 g fat, (n=9)

Fatty acids	Breed groups					
	BWD		BWDxTG		BWDxAN	
	x±Sx		x±Sx		x±Sx	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
C-13iso	0.05±0.010	0.03±0.004	0.03±0.002	0.04±0.001	0.04±0.002	0.03±0.001
C-13aiso	-	-	-	-	-	-
C-14iso	0.11±0.013	0.19±0.0.22	0.10±0.015	0.15±0.017	0.08±0.006	0.10±0.017
C-15iso	0.30±0.027	0.26±0.035	0.27±0.023	0.25±0.021	0.26±0.019	0.24±0.021
C-15aiso	0.22±0.022	0.25±0.024	0.23±0.018	0.24±0.022	0.24±0.015	0.26±0.029
C:16iso	0.28±0.013	0.26±0.0.010	0.25±0.012	0.23±0.016	0.23±0.019	0.20±0.017
C-17iso	0.31±0.24	0.35±0.028	0.35±0.023	0.40±0.032	0.30±0.024	0.32±0.021
C-17aiso	0.42±0.036	0.40±0.035	0.39±0.017	0.35±0.021	0.37±0.018	0.35±0.023
C-18iso	0.01±0.002	0.02±0.001	0.03±0.004	0.03±0.002	0.02±0.005	0.02±0.001

Table 5. Groups of fatty acids, g/ 100 g fat, (n=9)

Fatty acids	Breed groups					
	BWD		BWDxTG		BWDxAN	
	x±Sx		x±Sx		x±Sx	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
ΣCLA	0.45±0.038	0.50±0.076	0.35±0.064	0.40±0.078	0.41±0.098	0.44±0.054
Σ C-18:1 trans isomers	1.93 ±0.231	2.05±0.210	1.68±0.210	1.84±0.201	1.88±0.034	1.95±0.078
Σ C-18:1 cis isomers	22.52±0.878	23.15±0.675	20.58±0.766	21.65±0.543	20.42±0.089	22.09±0.832
Σ SFAs	74.27±0.956a*	72.34±0.786	77.65±0.943a*	75.81±0.589	76.74±0.569	75.76±0.0570
Σ MUFAs	25.66±0.876	26.73±0.786	23.72±0.765	24.86±0.766	23.47±0.899	25.33±0.769
Σ PUFAs	4.42±0.234	4.52±0.187	3.71±0.179	3.92±0.867	3.77±0.767	4.38±0.656
Σ omega-3	0.88±0.087	0.53±0.089	0.86±0.078	0.51±0.066	0.83±0.075	0.55±0.054
Σ omega-6	2.90±0,065	2.88±0.078	2.72±0.045	2.68±0.076	2.64 ±0.075	2.60±0.098
Σ omega-6/Σomega-3	3.31±0.453	5.43±0.798	3.16±0.423	5.25±0.954	3.18±0.876	5.10±0.768
Branched fatty acids	1.70±0.090	1.73±0.056	1.62±0.065	1.65±0.034	1.50±0.076	1.40±0.023

Note: a- BWD/BBWDxTG; *P<0.05

Table 6. Indices for goat's milk and kefir

Indices	BWD		BWDxTG		BWDxAN	
	goat's milk	kefir	goat's milk	kefir	goat's milk	kefir
LPS (g/100 g product)	9.98± 0.875	10.1±0.981	11.02±0.675	11.33±0.943	10.25 ± 0.523	10.44±0.923
AI	2.54±0.542	2.20±0.342	2.68±0.450	2.47±0.453	2.48 ±0.564	2.25±0.470
TI	2.76±0.365	2.43±0.423	2.98±0.576	2.65±0.598	2.80±0.498	2.72±0.761
h/H	0.61±0.923	0.63±0.123	0.60±0.879	0.62±0.267	0.62±0.834	0.65±0.343
TFAs (g/100 g product)	0.08±0.024	0.09±0.021	0.08± 0.043	0.09±0.012	0.08±0.0.321	0.09±0.016
SFAs+TFAs (g/100 g product)	3.09 ±0.507	3.40±0.520	3.47±0.487	3.83±0.421	3.57±0.489	3.73±0.321

The biologically significant omega 6/omega 3 ratio is recommended by nutritionists to be in the range of 5 [21], as in the present study an increase was registered to 5.10 g/ 100 g fat in BWDxAN, 5.25 g/ 100 g fat in BWDxTG and 5.43 for kefir from BWD, compared to raw milk. ΣCLA increased slightly by 0.05 g/100 g fat in the final product.

The qualitative assessment of milk fat was conducted on the basis of lipid indices in connection with determining the health impact of the product (Table 6).

The lipid preventive score used to evaluate the preventive activity of a given fat against the risk of cardiovascular diseases varies from 10.01 g/ 100 g of product for kefir from BWD to 11.33 g/ 100 g of product for BWDxTG. The lower content of myristic and palmitic acid in the final product suggests a lower value of the atherogenic index [8] in the separate batches of kefir (2.20 for BWD, 2.25 for BWDxAN, 2.47 for BWDxTG), compared to the original milk. The thrombogenic index is in the range of 2.43 for BWD to 2.72 for BWDxAN, whereas the cholesterolemic index is in low values below 1, both in milk and in the obtained product at the 24th hour.

Trans fatty acids (TFAs), obtained naturally, have a significant role in human nutrition and in the tested milk and kefir samples from different groups of goats, they have values of 0.08/0.09g/100 g of product, which gives us reason to refer them to products with a low TFAs content, according to Regulation (EC) No. 1924/2006.

CONCLUSIONS

The results for the fatty acid profile of the studied samples show that SFAs are reduced in milk kefir by 1.93 g/ 100 g fat for BWD, 1.84 g/ 100 g fat for BWDxTG and by 0.98 g/ 100 g fat for BWDxAN, whereas MUFAs and PUFAs prevailed in the milk from BWD breed. Essential fatty acids, omega-3 and omega-6, were low in all three batches.

The values of the lipid indices indicate a well-balanced fatty acid composition of goat's milk and its products. The atherogenic index of all three batches of kefir (2.20; 2.25; 2.47) was lower compared to the raw material (2.48; 2.54; 2.68), which defines them as healthier in terms of lipid content.

The data on saturated fatty acids in the studied kefirs at the 24th hour of production varied from 3.40 g/ 100 g product for BWD to 3.83 g/ 100 g product for BWDxTG, whence they refer to products with a high content of saturated fatty acids and low content of trans fatty acids (0.9 g/ 100 g product), according to Regulation (EC) No. 1924/2006.

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