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FOOD TECHNOLOGY

Lipid content and fatty acids compositions in commercial cuts of young goat meat

Bruna Aparecida Souza Machado[1*] Ivana Silva Gomes[2] Cassiane da Silva Oliveira Nunes[3] Graciele de Queiroz Andrade[2] Tatiana Barreto Rocha Nery[4] João Henrique de Oliveira Reis[2] Josiane Dantas Viana Barbosa[4] Janice Izabel Druzian[2]

[1]Departamento de Alimentos e Biotecnologia, Centro Universitário SENAI CIMATEC, Serviço Nacional de Aprendizagem Industrial (SENAI BA), 41650-010, Salvador, BA, Brasil. E-mail: brunam@fieb.org.br. *Corresponding author.
[2]Universidade Federal da Bahia (UFBA), Salvador, BA, Brasil.
[3]Instituto Federal Baiano (IF Baiano), Catu, BA, Brasil.
[4]Centro Universitário SENAI CIMATEC, Salvador, BA, Brasil.

ABSTRACT: *Brazil has the largest herd of goats of the American continent, with more than 9 million head. Goat farming is considered a growing and important activity for the economy, mainly in the northeastern region of Brazil .In this research, were determined the lipid content and the composition of fillet and shank fatty acids of young goats, registered in the inspection sector of the Ministry of Agriculture and marketed in the city of Salvador (Bahia). The average percentage of total lipids in the fillet was 1.68±0.04 and in the shank of 4.02±0.09, this is a significant difference between the cuts (P<0.05). Twenty-seven (27) fatty acids were identified in the cuts, most are palmitic acid (C16:0), stearic acid (C18:0) and oleic acid (C18:1ω9) present in 21.32%, 20.39%, 34.49% in the fillet and 21.74%, 21.94%, 33.38% in the shank, respectively. The total sums of saturated and polyunsaturated fatty acids ranged of 42.75 to 45.23% and 14.04 to 12.35% between fillet and shank cuts, respectively. The ratio of PUFA/SFA was 0.35 for fillet and 0.15 for shank, and the ratio ω6/ω3 was 3.07 for fillet and 2.27 for shank. Therefore, is a significant difference in total lipid content and fatty acid composition in commercial cuts of beef fillet and shank.*
Key words: *young goats, fillet, shank, total lipids, fatty acids.*

Teor lipídico e perfil de ácidos graxos de cortes comerciais de carne de caprinos juvenis

RESUMO: *O Brasil apresenta a maior população de caprinos do continente americano, com mais de nove milhões de cabeças, a caprinocultura é considerada uma atividade em ascensão e de grande importância para a economia, principalmente da região nordeste. No presente trabalho foram determinados o teor de lipídios totais e o perfil de ácidos graxos de amostras de filé e pernil de caprinos juvenil, registrados em órgãos de inspeção do Ministério da Agricultura e comercializados na cidade de Salvador (Bahia). O percentual* médio de lipídios totais no filé foi de *1,68±0,04 e no pernil de 4,02±0,09, com diferenças significativas entre os cortes (p<0,05). Foram identificados nos cortes, vinte e sete ácidos graxos, sendo os majoritários os ácidospalmítico (C16:0), esteárico (C18:0) e oleico (C18:1ω9) presentes em 21,32%, 20,39%, 34,49% no filé, e 21,74%, 21,94%, 33,38% no pernil, respectivamente. Os somatórios totais de ácidos graxos saturados e poli-insaturados variaram de 42,75 a 45,23% e de 14,04 a 12,35%, entre os cortes de filé e de pernil, respectivamente. A razão entre AGPI/AGS foi de 0,35 para o filé e de 0,15 para o pernil, e a razão ω6/ω3 foi de 3,07 para o filé e de 2,27 para o pernil. Constatou-se que existe uma diferença significativa no teor de lipídios totais e da composição de ácidos graxos em cortes comerciais de filé e pernil de carne caprina.*
Palavras-chave: *caprinos juvenis, filé, pernil, lipídios totais, ácidos graxos.*

INTRODUCION

Meats on the market compete with each other for consumer preference. This preference is historically associated with local tradition, as well as their preparation and consumption. Thus, the most consumed meat in Europe is pork, North America is poultry, Brazil and Argentina is bovine, New Zealand is sheep and Japan is fish meat. Consumption of goat meat is associated with the appeal to satisfaction, under sensory and cost evaluation, where the demand for these products is highly influenced by cultural issues, even in low consumption conditions.

The herd of Brazilian goats is of 9.78 million head, and Brazil is considered the 22nd largest producer in the world (LUCENA et al., 2017; MARTINS et al., 2016). Brazil's northeast region, for climatic and socioeconomic reasons, participates with about 93% of the national head goat farming. However, the share of the Brazilian goat meat product in the global market is still minor. Statistics on the consumption of goat meat in Brazil are unreliable because most of slaughtering happens for unofficial means and the number of the number of slaughterhouses that work with small domestic ruminants is still low. These factors difficult the

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reliable of the estimates of the actual size of the goat meat market in Brazil (LUCENA et al., 2017).

In the Brazilian northeast, slaughter of goats occurs mainly when they are aged between 8 and 12 weeks, resulting in a low carcass yield. Meat of young animals is well accepted for direct consumption, it is more softer, juicy and has flavor and characteristic odor less intense, unlike the adult animals meat (MADRUGA et al., 2005). Meat is a major source of fat in the human diet, especially saturated fats, which have been associated to cardiovascular disease and cancer. Thus, there has been growing interest in the composition of fatty acids present in this food, especially for consumers interested in maintaining a healthy diet (BRAND et al., 2018). Interest in goat meat has grown because of its nutritional properties, due to its low fat content, saturated fat and calories when compared with the ovine and bovine meat, and have similar levels of protein and iron (AMARAL et al., 2007; MONTE et al., 2012).

Several factors influence the quality of goat meat, being classified as intrinsic (species, race, sex and age) and extrinsic to the animal (nutrition, environment and pre and post-slaughter management). These factors affect the muscle structure and biochemistry of the postmortem muscle, acting on the sensory and technological attributes of the meat (TEIXEIRA et al., 2010). Physical-chemical characteristics of the meat determine its quality and acceptability, among them, the most relevant are color, softness and aroma. There is evidence that some branched-chain fatty acids are responsible for the characteristic aroma of goat meat from uncastrated male animals. In the pioneering study by WONG et al. (1975), they related the presence of fatty acids with branched chains with methyl group, present in the subcutaneous fat of goats, as components directly responsible for the characteristic odor of goats (FONTELES et al., 2018; WONG et al., 1975). These fatty acids were identified in the present study.

Increase in goat meat production has expanded significantly in the last years, which can be attributed mainly to its dietary characteristics and its acceptability by the consumer. The goat carcass usually has low amount of fat cover and intramuscular fat (MITZI et al., 2016). Studies available in the literature are based on the determination of fatty acid composition present in the goat meat carcass. Therefore, there is a deficiency regarding the fatty acid composition associated with individual cuts, such as fillet and shank, which are the most consumed and commercially available. Considering goat breeding a growing activity in Brazil and its importance for the economy of the northeast region, this research aimed to determine the total lipid contents and fatty acid composition of fillet and shank, of young goats marketed in the city of Salvador (Bahia). Samples of young goats were selected because they presented sensorial characteristics appreciated by consumers; and consequently, a greater acceptance in the market and this information is scarce in the literature. In addition, we also made a comparative analysis regarding the lipid profile of other species, such as bovine and pork, demonstrating the possible benefits of goat meat to human health.

MATERIALS AND METHODS

Collection and storage of samples

Samples of fillet and shank of products duly registered at the Ministry of Agriculture and purchased at supermarkets in the city of Salvador (Bahia) were analyzed. Three different batches of each cut, making six samples were analyzed in duplicate, totaling 12 analyzes of total lipids and 24 for the composition of fatty acids.

Extraction and determination of total lipids

The total lipids were extracted according to the cold extraction method of Bligh-Dyer. Aliquots of 5mL of the chloroform fraction were separated, dried with nitrogen and the total lipids were determined gravimetrically (BLIGH&DYER, 1959).

Transesterification of total lipids

Total lipids were subjected to the transesterification process for the preparation of methyl esters of fatty acids according to the methodology of JOSEPH&ACKMAN (1992). The upper phase (isooctane and methyl esters of fatty acids) was transferred to flakes with 5ml capacity, sealed tightly and stored at -18°C under N_2 for chromatographic analysis.

Chromatographic analysis of methyl esters of fatty acids

The fatty acid esters were analyzed on a CP 3800 gas chromatograph (Varian) using a CP-WAX 58 (FfAP) CB capillary column (25m x 0.25mm x 0.2µm) equipped with a flame ionization detector (CG-FID). The gas flows were 1.3mL.min^{1} for the entrainment gas H_2, 30mL.min^{-1} for the auxiliary gas ("make-up") $N_2$and 30 and 300mL.min^{1}for the flame gases H_2 and synthetic air, respectively. The split ratio of the sample was 1:100. The column

temperature was programmed at 150ºC for 16 minutes, then raised to 180ºC at a rate of 2ºC.min^{-1}, remaining at this temperature for 20 minutes. Then, the temperature was raised to 210°C at a rate of 5°C.min^{-1}, remaining at this temperature for 20 minutes. Injector and detector temperatures were 250°C and 280°C. The esterification of samples was done in duplicates, with injections of 1µL in each esterified sample. Quantification was performed by normalizing the peak areas and by internal standardization using the methyl ester of tricosanoic acid (C23:0) as internal standard. Results were converted by equation 1 milligram to fatty acid per 100g young goat meat (mg/100g).

A_x: fatty acid area; W_{is}: weight of internal standard (mg); CF_x: theoretical correction factor; A_{is}: internal standard area; W_s: oil weight (mg). Peak identification was done by comparing sample retention times with those of fatty acid methyl esters (Sigma189-19 USA) and the internal standard method, by introducing C23:0, during preparation of the samples, and comparing the response factors of each acid with the C23:0.

Statistical analysis

In this study, three cuts of fillet and three cuts of shank from young goat were analyzed. Results were presented as the mean obtained from the analysis of the three different samples of each cut (fillet n=3 and shank n=3). The results of this study were expressed as mean ± standard deviation (n=3). Statistical analyses of results were done using Statistica 6.0 (StatSoft, Tulsa). Data were analyzed using one-way analysis of variance (ANOVA) to test for the effect of cuts.

RESULTS AND DISCUSSION

Goat meat has been established as lean meat with favorable nutritional quality, which was also evidenced in this study. Its attributes are concordant with present day consumer demands for leaner and nutritious meat, and hence should be the basis for promoting the meat of a good diet. Moreover, sensory evaluations have shown that goat meat is acceptably palatable and desirable to consumers (WEBB et al., 2005; POUTZALIS et al., 2018). The determination of lipid content in the different samples of fillet and shank of young goats collected in supermarkets of the city of Salvador – Bahia are presented in Table 1.

The fillet samples showed lower total lipid content of the shank, with mean values of 1.68±0.05%. The mean values reported for shank were 4.02±0.08%.Statistical analysis showed that there was significant variation (P<0.05) for total lipids

$$Fatty\ acid\left(\frac{mg}{g}of\ oil\right) = \left(\frac{Ag\ x\ Wis\ x\ CFs}{Au\ x\ Wg x 1{,}04}\right) x\ 1000$$

between fillet and shank cuts. An important feature of goat meat is its fat distribution. Goats tend to deposit most of their fat internally (mesenteries, renal tract, and alimentary tract). This feature together with the reduced deposition of subcutaneous fat, makes goat meat leaner than mutton or beef (TSHABALALA et al., 2003).

In the study by HASHIMOTO et al. (2007), total lipid values of 3.29, 2.87 and 2.77% were found for carcass samples of young goats (5 months old) fed with corn and soybean rations, these values are lower than those found in this study for the shank sample and higher when compared to fillet samples. MADRUGA et al. (2002), evaluating the chemical profile of young goat meat (4 months old) found total lipid values of 2.06%. MAHGOUB et al. (2002) analyzed the muscles of young goats (2 months old) from Oman (Arabia) and found 4.59% of total lipids. The fat contents reported in this study are similar to those reported by PALEARI et al. (1998) (3.82%) for adult goat's thigh samples (2-3 years old), confirming once again the characteristic of goat meat as "lean" red meat, that is, low fat, regardless of the analyzed part.

The ratio of total lipid results reported in the present study, with studies evaluating these percentages in other species, shows that the young goat fillet has a lower total lipid content than beef 2.59g/100g (KUSS et al., 2005), of sheep 2.18g/100g (ZAPATA et al., 2001) and shank from pork 5.00g/100g (BRAGAGNOLO & RODRIGUEZ-AMAYA, 2002). The young goat fillet presented higher values of lipid when compared to female capybaras meat 1.09g/100g (JARDIM et al., 2003).

The composition of lipids in the meat of goats has been studied by several authors as a determinant of their quality. However, information on the fatty acid profile for young goats, especially polyunsaturated fatty acids (PUFA), are also limited.

In this work, twenty-seven fatty acids were identified in the fillet samples and twenty-six fatty acids in the shank sample, demonstrating that although different components of goat (fillet and shank) were analyzed, only C20:3ω3 acid was absent for the shank sample. Fatty acids were quantified by area normalization (%) and by internal standardization (mg/100g of sample) and are represented in Table 1. In general, statistical analysis showed that between the cuts there was a significant variation (P<0.05) between the values of fatty acids found for meat

Table 1 - Percentage of total lipid content and composition of fatty acids in cuts of young goats.

Cuts	----------Fillet----------		----------Shank----------	
Total lipids (%)	----------1.68±0.04[a]----------		----------4.02±0.09[b]----------	
Fatty acids	mg/100g	% of total FAMEs	mg/100g	% of total FAMEs
C10:0	0.50±0.01[a]	0.05±0.01[A]	1.28±0.04[b]	0.69±0.01[B]
C11:0	1.43±0.03[a]	0.12±0.03[A]	4.13±0.16[b]	0.12±0.02[A]
C13:0	2.72±0.03[a]	0.22±0.03[A]	5.66±0.36[b]	0.21±0.03[A]
C14:0	0.23±0.02[a]	0.02±0.01[A]	0.67±0.03[b]	0.02±0.01[A]
C14:1ω5	26.70±1.24[a]	2.29±0.18[A]	92.22±1.11[b]	2.34±0.13[A]
C15:0	1.38±0.14[a]	0.15±0.02[A]	8.52±0.09[b]	0.25±0.02[B]
C15:1ω5	6.55±0.40[a]	0.62±0.04[A]	24.84±0.93[b]	0.55±0.02[B]
C16:0	270.19±4.65[a]	21.68±0.49[A]	760.65±1.39[b]	21.74±0.44[A]
C16:1ω7	17.76±0.67[a]	1.59±0.11[A]	73.98±1.58[b]	1.81±0.11[B]
C17:1	10.71±0.64[a]	0.82±0.03[A]	27.28±0.67[b]	1.10±0.26[A]
C18:0	251.10±4.37[a]	20.26±0.53[A]	506.34±2.02[b]	21.94±0.57[A]
C18:1ω9	469.36±3.18[a]	34.72±1.06[A]	1184.54±6.79[b]	33.38±0.89[A]
9t-C18:1	37.39±1.24[a]	2.78±0.20[A]	109.14±3.33[b]	2.93±0.25[A]
C18:2ω6	84.79±1.76[a]	6.39±0.32[A]	98.73±1.28[b]	6.20±0.19[A]
9t,12t-C18:2	3.28±0.41[a]	0.35±0.02[A]	17.90±0.74[b]	0.39±0.04[A]
C18:3ω6	1.68±0.32[a]	0.09±0.01[A]	3.06±0.33[b]	0.16±0.01[B]
C18:3ω3	22.42±1.27[a]	1.63±0.08[A]	38.73±1.80[b]	1.54±0.04[A]
C20:0	1.93±0.16[a]	0.15±0.01[A]	4.55±0.15[b]	0.20±0.03[B]
C20:1ω9	1.45±0.10[a]	0.11±0.01[A]	2.25±0.03[b]	0.07±0.01[B]
C20:2ω6	8.93±0.92[a]	0.60±0.01[A]	7.35±0.31[b]	0.33±0.03[B]
C20:3ω6	4.17±0.37[a]	0.29±0.01[A]	3.99±0.24[a]	0.48±0.02[B]
C20:3ω3	1.43±0.47	0.10±0.02	(-)	(-)
C20:4ω6	36.78±3.12[a]	2.85±0.03[A]	30.75±1.65[b]	1.68±0.12[B]
C20:5ω3 (EPA)	16.61±1.25[a]	1.35±0.05[A]	14.54±0.53[a]	1.27±0.02[A]
C24:0	1.04±0.04[a]	0.10±0.01[A]	2.76±0.01[b]	0.06±0.01[B]
C22:6ω3 (DHA)	5.00±0.30[a]	0.39±0.02[A]	6.15±0.47[b]	0.30±0.03[B]
C24:1ω9	1.06±0.05[a]	0.08±0.01[A]	2.48±0.09[b]	0.12±0.03[A]
Total SFA	530.52±9.45[a]	42.75±1.14[A]	1294.56±4.25[b]	45.23±1.14[B]
Total MUFA	570.98±7.52[a]	43.01±0.21[A]	1516.73±14.53[b]	42.30±1.70[A]
Total PUFA	185.09±10.19[a]	14.04±3.66[A]	194.20±7.35[a]	12.35±0.50[A]
Total ω3	45.46±3.29[a]	3.47±0.17[A]	59.42±2.80[b]	3.11±0.09[B]
Total ω6	139.63±6.90[a]	10.58±3.49[A]	134.78±4.55[a]	9.24±0.41[A]
PUFA/SFA	0.35[a]	0.33[A]	0.15[b]	0.27[B]
ω6/ω3	3.07[a]	3.04[A]	2.27[b]	2.97[B]

FAME=Fatty Acid methyl esters expressed in mg/100g and % of total FAME. Average values ± standard deviation. (-)=not detected. Means within the same row bearing different letters (a–b) differed significantly (P<0.05). Means within the same row bearing different letters (A–B) differed significantly (P<0.05).
EPA=Eicosapentaenoic acid; DHA=Docosa-hexaenoic-acid; Total SFA, sum of saturated fatty acids; Total MUFA, sum of monounsaturated fatty acids; Total PUFA, sum of polyunsaturated fatty acids; Total ω3, sum of fatty acids ω3, including EPA and DHA; Total ω6, sum of fatty acids ω6.

cuts of young goats (when analyzed mg/100g).In the quantitative terms, the fatty acids that presented the highest proportion were: palmitic (C16:0), stearic (C18:0) and oleic (C18:1ω9) being found for medium fillets in percentages of 21.68, 20.26, 34.72 (76.66%) and for goat shank were 21.74, 21.94, 33.38 (77.06%).

The results of the literature regarding the content of C16:0, C18:0 and C18:1ω9 fatty

acids in goat samples collected in other regions are summarized in Table 2. The differences may be related to the analyzed cuts and the diet of the animals, since these factors represent a direct effect on the concentration of fatty acids present in the muscles (LEE et al., 2017; DALEY et al., 2010).

As previously mentioned, diet can be a determining factor for the quality of goat meat. FONTELES et al. (2018) evaluated thirty-six male goats grazing Caatinga (Brazil) native pasture, which were randomly assigned to 4 concentrate supplementation levels (0, 5, 10 and 15g/kg of body weight). On neutral lipids, supplementation increased the proportion of C18:1ω9 (31 to 40% of fatty acids) with supplementation. On polar lipids, supplementation reduced the dimethyl acetyls, C18:3ω3 and most of long chain PUFA proportions but increased the C18:1ω9. Considering the total meat fatty acids, supplementation led to an increase of the saturated and monounsaturated fatty acids contents and a decrease of the long chain ω-6 and ω-3 PUFA contents.

Values of C18:1ω9 determined in this study can also be compared with results presented for other animals. BRESSAN et al. (2004) evaluated samples of the brisket point end and flank steak of Capybara and recorded the presence of 35.75% C18:1ω9, values similar to those reported in this study in goat samples. MENEZES et al. (2006) found values of 43.00% C18:1ω9 for steers and ZAPATA et al. (2001), found values of 43.00% for sheep samples, results superior to those reported in this study for fillet and shank of goats. BRAGAGNOLO & RODRIGUEZ-AMAYA (2002) found an average oleic acid content of 1399mg/100g in pork shank samples. This value is similar to that reported in young goat shank, which was up to 1345.22mg/100g. Goat meat contains low amount of saturated fatty acids and cholesterol and it is a healthier alternative compared to other types of red meat (IVANOVIC et al., 2016).

The C18:1ω9, monounsaturated fatty acid, has great prominence in the physiological processes, as it provides the maintaining the fluidity of cell membranes besides having a hypocholesterolemic effect (SENEGALHE et al., 2014). In the various archives published by the Brazilian Society of Cardiology, it has already been elucidated that diets rich in oleic acid provided a reduction in plasma total cholesterol, LDL-c and LDL/HDL-c levels, demonstrating the positive effect of diets with high content of oleic acid in human food (SOCIEDADE BRASILEIRA DE CARDIOLOGIA, 2001; LOTTENBERG, 2009; MPIYE et al., 2015). Therefore, it is suggested that the consumption of goat meat may be beneficial to human health, since it has high amount of this fatty acid. In relation to the presence of linoleic (C18:2ω-6) and linolenic (C18:3ω-3) acids, necessary for the maintenance of cell membranes, brain functions and the transmission of nerve impulses, besides other functions in the human organism are observed in the cuts of goat meat evaluated in this study. In the results were found 84.79mg/100mg and 98.73mg/100mg of C18:2ω-6 in fillet and shank, and 22.42mg/100mg and 38.73mg/100mg of C18:3ω-3 in fillet and shank (Table 1).

The sum of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), PUFA, total fatty acids of the ω-3 and ω-6 groups and the ω3/ω6 and PUFA/SFA ratios are shown in Table 1. The total sums of SFA, MUFA and PUFA ranged of 42.75 to 45.23%, 43.01 to 42.30% and 14.04 to 12.35% between fillet and shank cuts, respectively. There was

Table 2 - Composition of C16:0, C18:0 and C18:1ω9 (%) in goat meat according to the literature.

Reference	Sample	C16:0	C18:0	C18:1ω9
MUSHI et al., (2010)	Goat meat from eastern Africa	17.49	20.43	28.84
ATTI et al., (2006)	Young goats from Tunisia	23.03	18.59	45.74
RHEE et al., (2000)	Male goats from Texas	20.51	16.27	42.43
SANTOS-FILHO et al., (2005)	Goat's muscle from Brazil	21.71	21.85	46.17
PALEARI et al., (1998)	Goat's shank from Italy	19.64	17.83	37.18
TSHABALALA et al., (2003)	South African indigenous goat	21.30	20.40	36.70
FONTELES et al., (2018)	Goats from Brazilian Semiarid	22.60	26.70	-
HAJJI et al., (2016)	North African goat	24.01	18.94	-
QUARESMA et al., (2016)	Goat kids from Portugal	19.80	16.10	25.5

no significant difference for total MUFA, PUFA and ω-6 between the cuts analyzed.

Also according to other studies, approximately half of the fatty acid present in goat meat are unsaturated, the MUFA accounts for c.a. 45% and the PUFA accounts for c.a. 10% of total fatty acids (BANSKALIEVA et al., 2000; HAJJI et al., 2016; CUNHA et al., 2018). Similar values in relation to total SFA, MUFA and PUFA were also reported by LEE et al. (2017) when they evaluated meat of Kiko crossbred goats (8 months old) fed a diet condensed tannins-containing pine bark.

Major fatty acids groups (SFA, MUFA and PUFA) from the goat varieties are in agreement with the results obtained in goat kid meat from seven Spanish native goat breeds (42–45% of SFA, 32–41% of MUFA and 16–26% of PUFA) raised in a semi-extensive feeding system (HORCADA et al., 2012), and Argentinean goat kids (38–42% of SFA, 36–39% of MUFA and 21–22% PUFA) reared on pasture (PEÑA et al., 2009).

The importance of meat as a source of PUFA has been extensively reviewed (BESSA et al., 2015; MAPIYE et al., 2015; SCOLLAN et al., 2014) and the general agreement is that meat from ruminant, as goat meat, is associated with a beneficial fatty acids profile for human nutrition. Conversely, goat meat is also a source of hyper-cholesteraemic fatty acid, as C16:0 (FAO, 2014).

Comparing results presented in Table 1 with results of the literature for cuts of other animals, it was observed that the fillet goat had lower contents of saturated fatty acids when compared to cuts of pork (135.8mg/100g), reported by BRAGAGNOLO &RODRIGUES-AMAYA (2002) showed higher levels when compared to steer cuts (50.5mg/100g) and sheep (50.51mg/100g), as identified by MENEZES et al. (2006) and SENEGALHE et al. (2014).

Regarding ω-3 PUFA, 100g of fillet goat meat contributes with 25.61mg of EPA + DHA, while 100g of shank goat meat provides 20.68mg of EPA + DHA. Considering that the recommended daily intake for primary prevention of cardiovascular diseases death was established on 250mg (MOZAFFARIAN & RIMM, 2006), 100 g of goat meat contributes with 10.24% (fillet) or 8.27% (shank). Similar results to this study were identified by QUARESMA et al., (2016) when evaluating the profile of noncertified goat meat from Portugal (8.1% of the recommended daily intake).

The ω-3 and ω-6 acids (C18:3ω-3) are not synthesized by the human body and; therefore, must be obtained through diet. They are essential acids, biologically active and have important functions in processes such as blood clotting and inflammation. In addition, they have an effect on various physiological processes and chronic diseases, on regulation of plasma lipid levels, cardiovascular and immune function, neuronal development and visual function. These acids compete for the same enzymes in the process of elongation and desaturation and do not convert into one another. Therefore, the efficiency in bioconversion will depend on the ratio of ω-6 to ω-3 in the food. The ideal ratio between ω-6 and ω-3 (ω6/ω3) is 1 to 4:1 (VIANA et al., 2016). The mean value of the ω6/ω3 ratio found in goat cuts was 3.07 and 2.27 for fillet and shank samples. These results are in accordance with the recommended value for the human diet. Thus, this ratio indicated that goat meat has superior quality in relation to pork, capybara, and Nellore, which presented ω6/ω3 ratio of 25.0, 16.0 and 6.9 (BRAGAGNOLO & RODRIGUEZ-AMAYA, 2002; JARDIM et al., 2003; RODRIGUES et al., 2004). Naturally high level of PUFA may indicate that goat meat has a potential to play a role as a source ω-3 PUFA (ABUELFATAH et al., 2016).

CONCLUSION

Consumption of goat meat has increased during the last 20 years, due to the nutritional (low fat and cholesterol) and sensorial features (flavor, juiciness, tenderness), which distinguish meat from this species. It was observed a variation of the total lipid content in the evaluated cuts, the shank presents 2.4 times higher lipid content than fillet. Profile of fatty acids presented in fillet and shank samples of young goats have a predominance of saturated and monounsaturated acids in relation to polyunsaturated fatty acids. This composition may be directly influenced by factors such as sex, age, slaughter weight, animal genotype, among others. Shank has 2.4 times more saturated fatty acids than fillets. The fillet had a higher ratio of PUFA/SFA, which is indicative of the nutritional quality of the foods, and the mean ratio between ω-6 and ω-3 (ω6/ω3) was 3.07 and 2.27 for fillet and shank samples, being within the recommended value for human diet.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

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