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Correlation between Intake and Composition of Fatty Acids in Meat from Lambs Fed Diets Containing Soybean Hulls

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Authors' contributions

This work was carried out in collaboration between all authors. Author LSCL designed and wrote the study. Authors RRS, GGPC and FFS supervised the experiment and performed statistics analyses. Author JIS supervised the analysis of the study. Author APGS held technical corrections and references. Authors MPVB, MML and GAF performed practical work and the author RMP performed the corrections of English and technical corrections. All authors read and approved the final manuscript.

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ABSTRACT

The present study aimed to evaluate the correlation between the composition of fatty acids in the diet and *Longissimus dorsi* muscle of lambs diets containing different levels of soybean. The experiment was conducted at the campus UESB, Itapetinga-Ba, Brazil. In a randomized design,

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twenty five male uncastrated male sheep were used. The treatments consisted of different levels of substitution of corn by soybean hulls (0, 25, 50, 75 and 100% replacement) and elephant grass silage as roughage was supplied the experimental period of 110 days. After this period, the animals were slaughtered and samples of *Longissimus dorsi* were collected and vacuum-packed for later analysis of the profile of fatty acids. The Pearson correlation coefficient was used to calculate the relationship between the composition of fatty acids consumed and intramuscular fatty acid content. The results demonstrated the existence positive correlation of moderate to strong between the consumed and the contained fatty acids in meat by increasing the content of conjugated linoleic acid, the acids from the n-3 and n-6 family reducing n-3 regarding the meat of lambs fed soybean hulls.

Keywords: Monounsaturated fatty acids; polyunsaturated fatty acids; saturated fatty acids; small ruminants; soybean hulls.

1. INTRODUCTION

The consumption of lamb meat has considerably increased over the last years [1]. Consumers' are demanding healthier food, as several campaigns for a healthy life is on media. Thus, it is essential to introduce techniques that improve meat quality standards and ensure continue market growth. The lipid fraction contained in meat from ruminants has been associated with coronary problems [2]. The scientific evidence establishes that diets that are high in saturated fat are related to increased levels of blood total and low density lipoproteins, which are associated with an increased risk of cardiovascular disease [3]. This has encouraged the meat industry and researchers to seek solutions to reduce saturated fatty acid content, and to increase levels of polyunsaturated fatty acids, especially those of n-3 and n-6 families, as well as the concentration of Conjugated Linoleic Acids (CLA). The anticarcinogenic effect of these compounds may increase the nutritional quality of these foods [4]. Lipids are the most variable chemical component of muscle and animal organisms.

There is great variation in chemical and physical components of sheep meat, which would be attributed to factors related to race, sex, age, diet and anatomical location of the cut and the muscle [5]. Accordingly, many factors influence both the quantity and quality of lipids deposited in products of animal origin [6].

Few studies can be found in literature about the correlation of lipids found in the diet and those found in lamb meat. Soybean is rich in protein, the Brazil is a great producer of soybean, which is used for human consumption, to extract oil and to feed animals. Soybean hulls is a co-product of the oil extraction and has 14% of crude protein, in dry matter base. Furthermore, soybean hulls have pectin as fiber component, a carbohydrate highly degradable, which helps to maintain healthy level of ruminal pH. The objective of this study was to assess the correlation between consumption and deposition of fatty acids in the meat of Santa Inês lambs fed diets containing soybean hulls.

2. MATERIALS AND METHODS

The experiment was conducted at Universidade Estadual do Sudoeste da Bahia, in the city of Itapetinga, Bahia, Brazil, from June to October 2009, according to the university animal welfare committee. Twenty five non-castrated male Santa Inês lambs with six months old and 22.0 ± 2.26 kg were housed in individual covered pens (1.10 x 1.0 m) provided with feeders and drinkers, with concrete floor. The animals were allotted to five treatments in a completely randomized design. The dietary treatments were: control treatment, inclusion of 25%, 50%, 75% and 100% (Table 1) of soybean hulls, totaling five treatments and five repetitions.

The concentrate was formulated according to the [7], for a daily gain of 200g of an isoproteic diet (Table 2) consisting of cracked corn, soybean meal, urea, mineral mixture and soybean hulls. Elephant grass silage was used as roughage. The forage: Concentrate ratio was 60:40. Forage and concentrate were hand-mixed at the time of the feeding.

The experimental period lasted 110 days. At the beginning of the adaptation period, the animals were identified with earrings and wormed for ecto and endo parasites. Food was daily provided at 06:00 a.m. and 03:00 p.m. and water was offered *ad libitum*.

Diets were sampled weekly and stored in plastic bags previously identified and frozen at -10ºC for fatty acid (FA) analysis. Samples were thawed at room temperature and dried in a ventilated oven at 65ºC, for 72 hours, and processed in Willey-type mill equipped with 1 mm mesh sieves for chemical analysis procedures.

Animals were slaughtered at a local facility, following the animal welfare standards. The carcasses were sent to the cold room (0-4ºC) for 24 hours. *Longissimus* muscles (LM) were sampled between the 12th and 13th rib and kept on -24ºC until the time of analysis. Samples of LM were thawed at room temperature, homogenized and analyzed in triplicate.

The extraction of the lipid fraction of LM was performed with a mixture of chloroform, methanol and water, (2:2:1.8 v/v/v, respectively), following the method of Bligh and Dyer [8]. In order to extract fat content of concentrates and silage, and determine the FA composition, moisture content was corrected to 80% in the stage of lipid extraction, according to the method of Bligh and Dyer [8].

Transesterification of triacylglycerol was performed according to ISO method 5509 [9]. Methyl esters were analyzed using a gas chromatograph mass spectrometer (Thermo-Finnigan) equipped with a flame ionization detector and BPX-70 fused silica capillary column (120m, 0.25 mm i.d.). The gas flow rate was 6.5 mL/min for the carrier gas (N_2), 30 ml/min for auxiliary gas (N_2), and 30 and 350 mL/min for the flame gases H_2 and synthetic air, respectively. The ratio was 90:10. The injector and detector temperatures were 250ºC and 280ºC, respectively. The total analysis time was 40 minutes, programmed on four ramp times, with initial temperature of 140ºC and final temperature of 238ºC. The injection volume was 1.5 µL and the peak areas were determined by the standardization method, using the Chrom Quest software, version 4.1. The quantification of FA was performed after the normalization of areas. Peaks were identified by comparison of retention time of standard methyl esters from Sigma fatty acids (USA) and after verification of the equivalent chain length.

The statistical analysis used was the Pearson's correlation to calculate the relation between the composition of consumed fatty acids and the intramuscular fatty acid content. Variable r assumes values between -1 (negative linear association) and 1 (positive linear association). Doing the calculation, the value is:

"r" values	Interpretation
0.00 to 0.19	Very weak correlation
0.20 to 0.39	Weak correlation
0.40 to 0.69	Moderate correlation
0.70 to 0.89	Strong correlation
0.90 to 1.00	Very Strong correlation

Source: [10]

The significance of the correlation coefficient was tested by the "t" test at 5% probability, using the statistical software [11].

3. RESULTS AND DISCUSSION

Polyunsaturated fatty acids (PUFA) and saturated fatty acids (SFA) corresponded to about 43% and 38%, respectively, of total fatty acids from diet (Table 3). However, the SFA's are predominant in lamb meat with 50% of total fatty acids, and 5% of PUFA (Table 4).

Table 1. Proportion of ingredients in concentrates (%) on a dry matter basis

Ingredients	Concentrate				
	Control[1]	25%[1]	50%[1]	75%[1]	100%[1]
Cracked corn	52.00	39.00	26.00	13.00	0.00
Soybean meal	42.60	42.80	43.00	43.20	43.30
Soybean hulls	0.00	13.00	26.00	39.00	52.00
Urea	2.40	2.20	2.00	1.80	1.70
Mineral mixture[2]	3.00	3.00	3.00	3.00	3.00
Total	100.00	100.00	100.00	100.00	100.00

[1]Inclusion level of soybean hulls in the total diet

[2] Levels of guarantee: 170 g Ca; 19 g S; 85 g P; 13 g Mg; 113 g Na; 600 mg Cu; 45 mg Co; 20 mg Cr; 1850 mg Fe; maximum of 850 mg F; 80 mg I; 1350 mg Mn; 16 mg Se and 4000 mg Zn

Table 2. Chemical composition of silage and concentrates, on a dry matter basis (%)

Components (%)	Silage	Control	25%	50%	75%	100%
Dry Matter	26.25	87.65	88.06	88.01	88.97	88.66
Crude Protein	5.87	14.26	13.25	13.64	13.84	13.70
Ether Extract	3.50	3.16	3.60	3.12	3.29	2.69
Ashes	8.68	4.59	5.83	5.73	5.93	6.14
Neutral Detergent Fiber	76.40	14.43	14.00	14.37	13.98	14.13
Acid Detergent Fiber	43.14	3.61	3.48	3.58	3.76	3.67

On the overall, there was as moderate correlation with most of the FA's analyzed. The C17:1 n-7 had a strong correlation with C18:0, C22:1 n-9, C18:3 n-3 and n-3.

Palmitic acid (C16:0) had a positive and moderate correlation with almost all analyzed FA. Palmitic acid is the precursor of palmitoleic acid (C16:1 n-7), as it undergoes desaturation by delta 9 desaturase [12]. [13] Palmitoleic acid is the quoted as being less effect hypercholesterolemic responsible for lipid metabolism and can help balance HDL and LDL cholesterol levels. Furthermore, palmitic acid is used in the formation of longer saturated or monounsaturated fatty acids (MUFA).

Heptadecenoic (C17:1 n-7) FA had a moderate or strong correlation with all the analyzed FA. The fatty acids from the diet are hydrolyzed, and then the polyunsaturated are rapidly hydrogenated by rumen micro-organisms, resulting in the production of saturated fatty acids (mainly stearic acid; 18:00). This is a major reason for the high saturated nature of lipids ruminants. This process also results in the formation of conjugated linoleic acid (CLA) and their intermediates, including the cis-9, trans-11 CLA acid and vaccenic (VA, trans-11 18:01) [14]. Pentadecanoic (C15:0), palmitic (C16:0), margaric (C17:0) and stearic (C18:0) FA in the diet were moderate and positive correlated (r = 0.54; 0.55; 0.50 and 0.52, respectively; (Table 5) with CLA of meat, which may contribute to the deposition in meat. A similar, but weaker effect was found for n-3 fatty acids.

CLAs are associated with antiatherogenic and anticarcinogenic effects [15]. The sheep meat is rich in saturated derivatives peculiar process of digestion of lipids in ruminant fatty acids. At the same time, grow the recommendations for organ health, the intake of polyunsaturated fatty acids (PUFA) and the balance between dietary unsaturated in relation omega 6: Omega 3 [16].

Most of the SFA's consumed were negatively correlated with the n-6:n-3 ratio observed in the meat of lambs. Negative correlations are also favorable results. It is interesting to note the reduction in the n-6:n-3 ratio due to the pro-inflammatory properties of n-6 whose intake should be reduced so as to help preventing diseases [17]. There is competition between the n-6 and n-3 FA for the enzymes involved in the chain elongation and desaturation reactions; Thus, there should be a balance in the intake of n-6 and n-3, since an excess of n-6 may prevent the generation of long chain derivatives of omega-3 FA [18].

Palmitoleic acid (C16:1 n-7) of the diet had a moderate positive correlation (Table 6) with margaric acid (C17: 0; r = 0.61) and heptadecanoic acid (C17:1 n-7; r = 0.42), and a moderate negative correlation with behenic acid (C22:0; r = -0.48). Polyunsaturated FAs of the n-7 family are formed from the C16:1 n-7 acid, through the desaturation and elongation processes.

Elaidic acid (C18:1 n-9t) in the diets were negative correlated with margaric (C17:0), heptadecanoic (C17:1 n-7), α-linolenic (C18: 3n-3) and n-3 acids present in the composition of meat from lambs, and there was a positive correlation with the n-6/n-3 ratio.

The correlations of oleic acid (C18:1 n-9) were negative for all analyzed FA. Much of the C18: 0 absorbed by the ruminant becomes previously deposition in muscle tissue, in oleic acid (C18: 1) the action of Δ9-desaturase enzyme [19].

Among representatives of the acids polyunsaturated, which have health benefits, relative to linolenic acid (18:3 n-3 LNA), linoleic (18:2 n-6 LA) and its intermediates can compete products for reactions mediated by the desaturases and elongases, in the case of sheep meat have good rates, corresponding to about 1% and 10% lipid, respectively [20]. This justifies the value for n-3, as α-linolenic is the bioprecursor of n-3, hence reducing the deposition of these FA's in meat.

Table 3. Fatty acids composition of diets (%) with increasing levels of soybean hulls

Fatty acids	Experimental diets				
	Control	25%	50%	75%	100%
C10:0	0.75	0.75	0.75	0.75	0.75
C12:0	7.91	7.91	7.91	7.91	7.91
C14:0	3.67	3.55	3.59	3.69	3.59
C15:0	0.34	0.33	0.34	0.35	0.35
C16:0	21.44	21.36	21.86	22.51	22.62
C16:1n-7	0.91	0.89	0.97	0.97	0.94
C17:0	0.25	0.26	0.26	0.28	0.28
C17:1n-7	0.04	0.04	0.04	0.03	0.04
C18:0	3.21	3.35	3.44	3.63	3.72
C18:1n-9t	0.30	0.29	0.28	0.29	0.27
C18:1n-9c	16.30	16.45	14.16	12.53	11.16
C18:1n-7	0.96	0.92	0.88	1.11	1.03
C18:2n-6	29.57	29.29	30.55	30.69	31.63
C18:3n-6	0.70	0.73	0.71	0.69	0.69
C18:3n-3	11.32	11.49	11.87	12.15	12.59
C20:1	0.45	0.50	0.46	0.46	0.45
C20:2	0.62	0.62	0.62	0.62	0.62
C22:1n-9	1.06	1.07	1.11	1.14	1.16
C22:4n-6	0.20	0.20	0.20	0.20	0.20
SFA	37.57	37.51	38.15	39.12	39.22
MUFA	20.02	20.16	17.90	16.53	15.05
PUFA	42.41	42.33	43.95	44.35	45.73
PUFA:SFA	1.13	1.13	1.15	1.13	1.17
n-6	30.47	30.22	31.46	31.58	32.52
n-3	11.32	11.49	11.87	12.15	12.59
n-6:n-3	2.69	2.63	2.65	2.60	2.58

Table 4. Fatty acid composition (%) of meat from Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty Acids	Experimental diets				
	Control	25%	50%	75%	100%
C10:0	0.684	0.843	0.538	0.109	0.104
C14:0	1.608	1.771	1.406	1.807	1.919
C14:1	0.200	0.162	0.138	0.198	0.214
C15:0	0.272	0.259	0.258	0.410	0.350
C16:0	25.962	25.840	24.181	24.842	25.123
C16:1	1.433	1.446	1.102	1.976	2.093
C17:0	0.846	0.833	1.029	1.066	1.094
C17:1	0.694	0.733	0.794	0.857	0.932
C18:0	18.294	18.329	21.224	18.545	17.892
C18:1 n-9t	1.358	1.048	1.267	1.731	1.590
C18:1 n-9c	40.262	40.971	40.517	41.984	40.868
C18:2 n-6	5.244	4.419	4.585	3.722	4.581
C18: 3 n-3	0.227	0.288	0.316	0.317	0.398
CLA	0.317	0.298	0.325	0.360	0.400
C20:3 n-6	0.163	0.170	0.189	0.253	0.173
C22:0	2.236	2.366	1.949	1.563	2.050
C22:2 n-6	0.200	0.224	0.182	0.260	0.219
SFA	49.903	50.241	50.585	48.342	48.532
MUFA	43.947	44.360	43.818	46.746	45.697
PUFA	6.151	5.399	5.597	4.912	5.771
PUFA:SFA	0.123	0.107	0.111	0.102	0.119
n-6	5.607	4.813	4.956	4.235	4.973
n-3	0.227	0.288	0.316	0.317	0.398
n-6:n-3	24.700	16.712	15.684	13.360	12.495

Table 5. Correlation between saturated fatty acids in the diet and those in the meat from Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty acids in meat	Fatty acids in diet									
	C14:0		C15:0		C16:0		C17:0		C18:0	
	r	P	r	P	R	P	r	P	r	P
C10:0	-	-	0.45	0.0130	0.48	0.0086	0.55	0.0026	0.50	0.0064
C15:0	-	-	0.37	0.0379	0.36	0.0416	0.36	0.0401	-	-
C16:1n-7	-	-	0.55	0.0027	0.55	0.0029	0.56	0.0020	0.53	0.0039
C17:0	-	-	0.61	0.0007	0.67	0.0002	0.62	0.0005	0.65	0.0003
C17:1 n-7	-	-	0.59	0.0012	0.67	0.0002	0.67	0.0002	0.70	0.0001
C18:1 n-9t	-	-	0.45	0.0140	0.41	0.0248	0.36	0.0416	-	-
C18:3 n-3	-	-	0.37	0.0386	0.48	0.0092	0.49	0.0069	0.55	0.0029
CLA	-	-	0.54	0.0034	0.55	0.0029	0.50	0.0060	0.52	0.0048
C22:0	0.35	0.046	-0.42	0.0193	-0.42	0.0199	-0.40	0.0254	-0.35	0.0444
n-3	-	-	0.37	0.0386	0.48	0.0092	0.49	0.0069	0.55	0.0029
n-6:n-3	-	-	-0.37	0.0390	-0.52	0.0047	-0.60	0.0008	-0.62	0.0006

Table 6. Correlation between monounsaturated fatty acids in the diet with fatty acid composition in the meat of Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty acids in meat	Fatty acids in diet									
	C 16:1n-7		C18:1 n-9t		C18:1 n-9c		C18:1 n-7		C22:1 n-9	
	R	P	R	P	r	P	r	P	R	P
C10:0	-	-	-	-	-0.43	0.0171	0.59	0.0011	0.44	0.0146
C14:1 n-7	-	-	-	-	-	-	0.37	0.0365	-	-
C15:0	-	-	-	-	-	-	0.40	0.0261	-	-
C16:1n-7	-	-	-	-	-0.51	0.0052	0.60	0.0009	0.50	0.0059
C17:0	0.61	0.0008	-0.52	0.0045	-0.68	0.0001	0.38	0.0323	0.68	0.0001
C17:1 n-7	0.42	0.0196	-0.62	0.0006	-0.69	0.0001	0.42	0.0209	0.70	0.0001
C18:1 n-9t	-	-	-	-	-0.37	0.0371	0.41	0.0232	0.36	0.0425
C18:3 n-3	-	-	-0.58	0.0014	-0.52	0.0046	-	-	0.53	0.0039
CLA	-	-	-0.43	0.0185	-0.56	0.0023	0.39	0.0295	0.54	0.0032
C22:0	-0.48	0.0082	-	-	0.37	0.0360	0.39	0.0287	-0.38	0.0315
n-3	-	-	-0.58	0.0014	-0.52	0.0046	-	-	0.53	0.039
n-6:n-3	-	-	0.57	0.0018	0.52	0.0042	-	-	-0.56	0.0021

Erucic acid (C22:1 n-9) content in the diet had a positive correlation with most of the FAs found in meat, whereas a negative and moderate correlation was identified for n-6/n-3 (r = -0.56).

Linoleic acid (C18:2 n-6) had a moderate positive correlation with acids palmitoleic (C16:1 n-7), margaric (C17:0), heptadacenoic (C17:1 n-7), α-linolenic acid (C18:3 n-3), and CLA and n-3 (Table 7). It is presumable that their escape has occurred in the rumen, i.e., its biohydrogenation was not complete, but absorbed by the intestinal epithelium and deposited in the meat [21].

The C18:2 n-6 was also negatively correlated with the n-6/n-3 ratio (r = -0.46), negative correlations are favorable results however, it is interesting to reduce the n-6/n-3 ratio, due to pro-inflammatory properties of n-6 and should be decreased their intake to aid in disease prevention [17]. [18] There is a competition between fatty acids of family n-6 and n-3 reactions by the enzymes involved in the desaturation and chain elongation and should therefore be balanced intake of n-6 and n-3 because excess n-6 may preclude by competition effect the transformation of the fatty acid of the omega-3 series derivatives in the long chain. Thus, linoleic acid (C18:2 n-6) has contributed to that goal.

The γ linolenic acid (C18:3 n-6) was a negative correlated with all the analyzed FA's. On the other hand, α-linolenic acid (C18:3 n-3) only had moderate and strong positive correlations. This FA is the precursor of the n-3 family FA. Only the n-6/n-3 (r = -0.57) ratio has negatively correlated with α-linolenic acid, which can be explained by the high levels of n-6 contained in the diet designed to the animals, thus corroborating the values found.

Dietary SFA's were positively correlated with C18:3 n-3 (r = 0.47), CLA (r = 0.54) and n-3 (r = 0.47; Table 8); and were negative and moderate correlated with n-6:n-3 (r = -0.53). Monounsaturated fatty acids were positive and moderate correlated with n-6:n-3 (r = 0.44), as a result of the negative correlation with n-3 (r = -0.53).

The correlations of the ratio PUFA:SFA have contributed to an improvement in the composition of meat, since they were moderate and positive correlated with CLA (r = 0.43) and n-3 (r = 0.50), which are FA's that have some benefits to meat consumption.

Fatty acids from the n-6 series (Table 9) were positive moderate correlated with palmitoleic (C16:1n-7; r = 0.44), margaric (C17:0; r = 0.68), heptadacenoic (C17: 1 n-7; r = 0.68) and α-linolenic (C18: 3 n-3; r = 0.52) FAs, and CLA (r = 0.55) and n-3 (r = 0.52), and were negative moderate correlated with n-6/n-3 ratio (r = -0.47). The n-6 content in diet did not contribute to the deposition of n-6 in the muscle; Yet, there was an increase in n-3 and a consequent reduction in n-6/n-3 ratio, since there is a preference of enzymes for omega-3 acids, instead of omega-6 acids.

The n-3 fatty acids in the diet have favored the deposition of the α-linolenic acid (r = 0.56), CLA (r = 0.54) and n-3 family (r = 0.56) in meat. As expected, negative correlation was only found in the n-6/n-3 ratio (r = - 0.57).

Table 7. Correlation between polyunsaturated fatty acids in the diet and fatty acid composition in the meat of Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty acids in meat	Fatty acids in diet					
	C18:2 n-6		C18:3 n-6		C18:3 n-3	
	r	P	R	P	R	P
C10:0	-	-	-	-	0.44	0.0152
C14:1 n-7	-	-	-0.39	0.0299	-	-
C16:0	-	-	-	-	-	-
C16:1n-7	0.44	0.0151	-0.43	0.0161	0.51	0.0056
C17:0	0.68	0.0001	-0.44	0.0150	0.66	0.0002
C17:1 n-7	0.67	0.0001	-0.39	0.0283	0.71	0.0001
C18:1 n-9t	-	-	-0.42	0.0213	-	-
C18:3 n-3	0.52	0.0045	-	-	0.56	0.0022
CLA	0.55	0.0025	-0.46	0.0121	0.54	0.0028
n-3	0.52	0.0045	-	-	0.56	0.0022
n-6:n-3	-0.46	0.0115	-	-	-0.57	0.0018

Table 8. Correlation between polyunsaturated fatty acids in the diet and fatty acid composition in the meat of Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty acids in meat	Fatty acids in diet							
	SFA		MUFA		PUFA		PUFA:SFA	
	r	P	R	P	r	P	r	P
C10:0	0.49	0.0070	-0.38	0.0313	-	-	-	-
C15:0	0.36	0.0396	-	-	-	-	-	-
C16:1n-7	0.55	0.0026	-0.50	0.0064	-0.42	0.0201	-	-
C17:0	0.67	0.0002	-0.54	0.0032	-	-	0.48	0.0081
C17:1 n-7	0.67	0.0002	-0.64	0.0004	-0.49	0.0069	0.53	0.0034
C18:1 n-9t	0.40	0.0252	-	-	-	-	-	-
C18:2 n-6	-	-	-	-	-	-	-	-
C18:3 n-3	0.47	0.0094	-0.53	0.0036	-0.45	0.0130	0.50	0.0056
CLA	0.54	0.0032	-0.55	0.0027	-0.46	0.0125	0.43	0.0166
C22:0	-0.42	0.0191	-	-	-	-	-	-
n-3	0.47	0.0094	-0.53	0.0036	-0.45	0.0130	0.50	0.0056
n-6:n-3	-0.53	0.0039	0.44	0.0161	-	-	-	-

Table 9. Correlation between fatty acids n-3, n-6 and n-6/n-3 ratio in the diet and fatty acid composition in the meat of Santa Inês lambs fed diets containing increasing levels of soybean hulls

Fatty acids in meat	Fatty acids in diet					
	n-6		n-3		n-6:n-3	
	r	P	r	P	R	P
C10:0	-	-	0.44	0.0152	-0.56	0.0016
C14:0	-	-	-	-		
C16:1n-7	0.44	0.0157	0.50	0.0056	-0.54	0.0026
C17:0	0.68	0.0001	0.66	0.0002	-0.50	0.0053
C17:1 n-7	0.68	0.0001	0.70	0.0001	-0.63	0.0003
C18:3 n-3	0.52	0.0042	0.56	0.0022	-0.52	0.0035
CLA	0.55	0.0025	0.54	0.0028	-0.44	0.0135
n-3	0.52	0.0042	0.56	0.0022	-0.52	0.0035
n-6:n-3	-0.47	0.0109	-0.57	0.0018	0.66	0.0001

Most correlations found between the n6/n3 ratio from diet were negative, for the majority of the fatty acids important to human health, showing that such rate has not contributed for a better fatty acid composition in meat.

4. CONCLUSION

Correlations between the consumed fatty acids and those found in the composition of meat show that the diet provided to animals has modified the fatty acid profile by increasing the content of conjugated linoleic acid, the acids from n-3 family, and reducing the n-6:n-3 ratio in the meat of lambs fed soybean hulls.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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