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Lipid profile and cholesterol of pork with the use of glycerin in feeding

[*Perfil lipídico e colesterol da carne de suínos com uso de glicerina na alimentação*]

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ABSTRACT

The aim of this work was to evaluate the effects of adding different levels of glycerin in the feeding on the lipid profile and cholesterol of the meat of finishing pigs. The experiment was arranged in a completely randomized design (CRD) with factorial 5x2, being five levels of glycerin in the diet and two genders. Sixty (60) swine of the Topigs genetics (30 barrows and 30 gilts) were used; they presented initial average weight of 79.3+4.0kg and were finished with the weight of 106.2+4.5kg. The levels of glycerin utilized were 0, 50, 100, 150 and 200g/kg in the natural matter. The analyses of lipid and cholesterol profile were conducted in the muscles *longissimus dorsi* (loin) and *semimembranosus* (ham) on the left side of the carcasses. Interaction occurred between the levels of crude glycerin in the diet and the sexual category for the profile of fatty acids and cholesterol. On the loin the meat of the barrows presented higher means of C16:0, C16:1, C20:3ω3, C18:1ω9c, Total of saturated (SFA) and monounsaturated (MUFA) fatty acids. On the ham, increased means were found for the fatty acids C18:1ω9c, MUFA, activity of Δ9-desaturase^{C18} and Elongase^{C16-18} in barrows. The sows' meat presented higher proportions of polyunsaturated fatty acids and of the series ω6 for both the cuts. The amount of cholesterol in the sows' meat presented increase according to the level of glycerin in the meat. The barrows' meat presented indices of atherogenicity greater than the gilts. The levels of glycerin altered the lipid profile and cholesterol content according to the sexual category, promoting a distinct effect on the loin and ham.

Keywords: biofuel, fatty acids, nutritional composition

RESUMO

O objetivo deste trabalho foi avaliar os efeitos do fornecimento de diferentes níveis de glicerina na alimentação sobre o perfil lipídico e colesterol da carne de suínos em terminação. O delineamento experimental foi organizado inteiramente ao acaso (DIC), com fatorial 5x2, sendo: cinco níveis de glicerina na dieta e dois sexos. Foram utilizados 60 suínos da genética Topigs (30 machos castrados e 30 fêmeas), apresentando peso médio inicial de 79,3+4,0kg, e foram terminados com peso de 106,2+4,5kg. Os níveis de glicerina utilizados foram de 0, 50, 100, 150 e 200g/kg na matéria natural. As análises de perfil lipídico e de colesterol foram realizadas nos músculos longissimus dorsi *(lombo) e* semimembranosus *(pernil) do lado esquerdo das carcaças. Ocorreu interação entre os níveis de glicerina bruta na dieta e a categoria sexual para o perfil de ácidos graxos e colesterol. A carne dos machos castrados apresentou no lombo maiores médias de C16:0, C16:1, C20:3ω3, C18:1ω9c, Total de ácidos graxos Saturados (SFA) e Monoinsaturados (MUFA). No pernil, maiores médias foram verificadas para os ácidos graxos C18:1ω9c, MUFA, atividade da Δ9-desaturase^{C18} e Elongase$^{C16-C18}$ em machos castrados. A carne das fêmeas suínas apresentou maiores proporções de ácidos graxos poli-insaturados e da série ω6 para ambos os cortes. A quantidade de colesterol na carne das fêmeas suínas apresentou aumento em função do nível de glicerina na dieta. A carne dos machos castrados apresentou maiores índices de aterogenicidade que das fêmeas. Os níveis de glicerina alteraram o perfil lipídico e teor de colesterol em função da categoria sexual, promovendo efeito diferenciado no lombo e pernil.*

Palavras-chave: biocombustível, ácidos graxos, composição nutricional

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INTRODUCTION

Crude glycerin is one of the by-products of biodiesel production, its use has been growing in animal feeding as a way of reducing the costs of the diets of the several meat-producing species. Crude glycerin contains glycerol contents ranging from 80 to 95 %, this being a precursor for triacylglycerol and phospholipids synthesis in the liver and adipose tissue (Boyle, 2005; Cerrate *et al.*, 2006).

In general pork presents a predominance of the fatty acids oleic (C18:1ω9), palmitic (C16:0), linoleic (C18:2ω6), stearic (C18:0) and arachidonic (C20:4ω6) (Wood *et al.*, 2003; Nuernberg *et al.*, 2005; Teye *et al.*, 2006). Nevertheless, one of the main factors which lead to the deposition of fatty acids as well as their profiles, is the feeding that the animals receive (Mitchaothai *et al.*, 2007).

However, the increase in the level of information of the world population as to the importance of a diet with lower levels of saturated fat has led to increased search for meats which present, in their characteristics, better balance between saturated, monounsaturated and polyunsaturated fatty acids and low ratio ω6/ω3. The content in essential fatty acids plays an outstanding role in human nutrition, since they are integrant of cell structures and precursors of the synthesis of several substances essential to the maintenance of the physiological processes (Perini *et al.*, 2010).

In this way, studies should be conducted on crude glycerin, since glycerol is utilized in lipogenesis and even in gluconeogenesis, which could contribute towards the increase in the lipid contents and modification of the lipid profile in pork.

MATERIAL AND METHODS

The animals were reared in the Finishing House of the Swine Culture Sector of the Animal Science Department of the Federal University of Lavras (UFLA) in the municipality of Lavras - MG. Thirty barrows and 30 gilts of the genetics Topigs, with initial average weight of 79.3±4.00kg and finished with weight of 106.2±4.5kg were utilized. This study was approved by the Ethics Committee on Animal Use UFLA with protocol number 011/2010. The experiment was arranged in a completely randomized design (CRD) with factorial 5x2, being five levels of glycerin in the diet (0, 50, 100, 150 and 200g/kg) and two genders (male (barrow) and female (gilt)), with 6 replicates per treatment and each experimental unit consisted of one animal, totaling 60 pigs. The experimental diets were formulated on the basis of corn and soybean meal, supplemented with vitamins, minerals and aminoacids to meet the minimum requirements for barrows of high genetic potential from 70 to 100kg (Table 1) with the utilization of different levels of crude glycerin.

The treatments were carried out in the following way: Treatment 1 – basal diet without the addition of glycerin; Treatment 2 – 50g/kg of glycerin instead of corn in the basal diet in the natural matter; Treatment 3 – 100g/kg of glycerin instead of corn in the basal diet in the natural matter; Treatment 4 - 150g/kg of glycerin instead of corn in the basal diet in the natural matter and, Treatment 5 - 200g/kg of glycerin instead of corn in the basal diet in the natural matter. The animals were given water and feed ad libitum during the experimental period of 30 days.

At the end of the experiment, after fasting and water diets for 12 hours' time, the animals were slaughtered under humanitarian conditions through electric insensibilization (electronarcosis) with later bleeding and evisceration.

After 24 hours' cooling of the carcasses in cold room (±5ºC), the collection of the samples of the muscles *Longissimus dorsi* (loin) and *Semimembranosus* (ham) on the left side of the carcasses was done. The samples were carried refrigerated into the Laboratory and then they were frozen for later determination of the lipid profile in the Meat and Fish Technology and Chromatography Laboratory in the Chemistry Department. For determination of the fatty acid profile, samples of the muscle *Longissimus dorsi* (loin) *and Semimembranosus* (ham) after thawing at 5ºC for 24 hours in a refrigerator were utilized.

Table 1. Centesimal composition and values calculated in the experimental diets

Ingredients	Levels of glycerin[1] (g/kg of natural matter)				
	0	50	100	150	200
Ground corn	707	654.5	603.0	551.0	499.0
Soybean meal	229	238	247	258	266
Crude glycerin	0	50	100	150	200
Soybean oil	20.0	16.8	13.3	9.0	5.9
Bicalcium phosphate	11.2	11.2	11.2	11.2	11.2
Calcitic limestone	7.7	7.7	7.7	7.7	7.7
Salt (NaCl)	3.6	1.35	0	0	0
Mineral Premix [2]	1.0	1.0	1.0	1.0	1.0
Vitamin Premix [3]	1.0	1.0	1.0	1.0	1.0
DL-Metionina 99	0.09	0.1	0.1	0.1	0.15
L-Lysine 99	1.5	1.35	1.2	1.0	0.9
L-Threonine 98	0.07	0.07	0.07	0.07	0.07
Tylan[4]	0.2	0.2	0.2	0.2	0.2
Caulim	17.64	16.73	14.23	9.73	6.88
Calculated Values					
Metabolizabale Energy (KCal/kg)	3.250	3.250	3.250	3.250	3.250
Digestible Lysin (g/kg)	8.19	8.21	8.23	8.27	8.31
Digestible Methionine (g/kg)	2.50	2.50	2.50	2.50	2.50
Crude protein (g/kg)	160,2	160.2	160.2	160.2	160.2
Digestible threonine (g/kg)	5.50	5.50	5.50	5.50	5.50
Available phosphosrus (g/kg)	3.00	3.00	3.00	3.00	3.00
Calcium (g/kg)	6.50	6.50	6.50	6.50	6.50

[1] Glycerin composition: Sodium chloride, 36.8g/kg; Sodium, 25,1g/kg; Methanol, 0,2g/kg; Organic Residues, <0,1g/kg; Moisture,111.2g/kg; Ashes, 60,6g/kg; Density, 1,264g/ml; Glycerol, 831,2g/kg; Color: Light yellow; [2] Composition, per kg of the product: calcium, 98.800mg; cobalt, 185mg; copper, 15.750mg; iron, 26.250mg; iodine, 1.470mg; manganese, 41.850mg; zinc, 77.999mg. [3] Composition, per kg of the product: folic acid, 116.55mg; panthotenic acid, 2.333,5mg; biotin, 5,28 mg; niacin, 5.600mg; pyridoxine, 175mg; riboflavin, 933,3mg; thiamine, 175mg; Vit. A, 1.225.000U.I.; Vit. D_3, 315.000U.I.; Vit. E, 1.400mg; Vit. K_3, 700mg; Vit B12, 6.825mg; Selenium, 105mg; Antioxidant: 1.500mg.; [4] Antibiotic on the basis of granulated tylosin.

For the analysis of cholesterol and fatty acids (FA), lipids were extracted according to the procedures described by Folch *et al.* (1957) being esterified and separated (Hartman and Lago, 1973). Cholesterol was quantified by colorimetry, with a modification of the method of Bohac *et al.* (1988), as described by Bragagnolo and Rodriguez-Amaya (2002) and the results were expressed in mg/100g of meat.

The analysis of fatty acids was done by gas chromatography in a chromatograph Shimatzu CG 2010 (Agilent Technologies Inc., Palo Alto, CA, USA), equipped with a flame ionization detector, *split* injector at the rate of 1:50 and capillary column of Supelco SP™-2560, 100m X 0.25mm X 0.20 μm (Supelco Inc., Bellefonte, PA, USA). The chromatographic conditions were initial temperature of the column of 140ºC/5 minutes; increased 4ºC/minute to 240ºC and kept for 30 minutes, amounting to 60 minutes. The injector temperature was 260ºC and that of the detector 260ºC. The carrier gas utilized was helium. The fatty acids were identified by comparison with the retention times presented by the chromatographic standard Supelco™37 standard FAME Mix (Supelco Inc., Bellefonte, PA, USA) and expressed in percentage (%) of the total of fatty acids identified and afterwards grouped together into: Total of Saturated Fatty Acids (SFA), Total of Monounsaturated Fatty Acids (MUFA) and Total of Polyunsaturated Fatty Acids (PUFA).

The activity of enzyme Δ^9 desaturase and elongase was estimated according to Malau-Aduli *et al.* (1998) and Kazala *et al.* (1999). The indices of atherogenicity and thrombogenicity, considered as a health indicator related to the risk of cardiovascular disease, were computed according to Ulbricht and Southgate (1991).

The data were surveyed by the statistic program SISVAR®. The variables for analysis of variance for the factors levels of glycerin and gender and/or interaction among them were analyzed by the SNK Test ($\alpha = 0.05$).

RESULTS AND DISCUSSION

The use of different levels of crude glycerin showed distinct efficiency in the lipid profile of the loin for the sexual categories utilized, an interaction among these factors being found for the following fatty acids: pentadecanoic (C15:0); stearic (C18:0); Oleic (C18:1ω9); Linoleic (C18:2ω6); Arachidonic (C20:4ω6); Total of Monounsaturated acids (MUFA); Total of Polyunsaturated acids (PUFA); Total of ω6; Ratio Polyunsaturated/Saturated acids (PUFA/SFA); Activity of Δ9-desaturase^{C16}; Activity of Δ9-desaturase^{C18}; Activity of Elongase $^{C16-C18}$ (Table 2).

Table 2. Composition of the fatty acids of the loin of pigs depending on the glycerine level of feeding and gender

Variable	Gender	Glycerin levels (g/kg of natural matter)					Means	CV	Value of P[2]		
Fatty acids		0	50	100	150	200		(%)[1]	N	S	NxS
C12:0	Barrow	0.07	0.04	0.07	0.03	0.08	0.06	136.52	0.534	0.172	0.912
	Gilt	0.06	0.07	0.11	0.07	0.14	0.10				
	Means	0.07	0.06	0.11	0.05	0.11	0.08				
C14:0	Barrow	0.97	1.19	0.95	0.95	1.18	1.05	31.40	0.350	0.947	0.712
	Gilt	1.13	1.20	0.98	0.93	0.97	1.04				
	Means	1.05	1.19	0.96	0.94	1.08	1.05				
C14:1	Barrow	0.07	0.03	0.05	0.02	0.02	0.04	170.67	0.827	0.135	0.157
	Gilt	0.02	0.07	0.04	0.16	0.08	0.08				
	Means	0.05	0.05	0.05	0.09	0.05	0.06				
C15:0	Barrow	0.15^{aA}	0.11^{aA}	0.07^{aA}	0.05^{aB}	0.04^{aA}	0.08	192.85	0.034	0.116	0.014
	Gilt	0.10^{bA}	0.10^{bA}	0.04^{bA}	0.68^{aA}	0.05^{bA}	0.19				
	Means	0.13^{ab}	0.10^{ab}	0.06^{b}	0.36^{a}	0.05^{b}	0.14				
C16:0	Barrow	25.06	25.58	24.43	25.00	24.69	24.95^{A}	3.80	0.322	0.001	0.141
	Gilt	24.38	23.95	24.556	23.45	23.50	23.97^{B}				
	Means	24.72	24.77	24.50	24.23	24.09	24.46				
C16:1	Barrow	3.22	2.54	3.48	3.25	3.14	3.13^{A}	19.76	0.644	0.031	0.057
	Gilt	2.71	3.08	2.81	2.47	2.88	2.79^{B}				
	Means	2.96	2.81	3.15	2.86	3.01	2.96				
C17:0	Barrow	0.35	0.21	0.50	0.36	0.30	0.34	55.69	0.063	0.586	0.633
	Gilt	0.25	0.32	0.47	0.46	0.36	0.37				
	Means	0.30	0.26	0.49	0.41	0.33	0.36				
C17:1	Barrow	0.10	0.12	0.16	0.33	0.31	0.22	94.21	0.572	0.389	0.147
	Gilt	0.18	0.23	0.25	0.23	0.08	0.18				
	Means	0.16	0.18	0.21	0.28	0.19	0.20				
C18:0	Barrow	11.02^{bA}	12.65^{aA}	11.73^{abA}	11.52^{abA}	11.94^{abA}	11.77	7.86	0.215	0.604	0.036
	Gilt	11.47^{aA}	11.41^{aB}	11.98^{aA}	12.31^{aA}	11.06^{aA}	11.65				
	Means	11.25	12.03	11.85	11.91	11.50	11.71				
C18:1ω9t	Barrow	0.21	0.06	0.16	0.10	0.11	0.13	215.98	0.740	0.805	0.580
	Gilt	0.06	0.03	0.08	0.28	0.11	0.11				
	Means	0.13	0.04	0.12	0.19	0.11	0.12				
C18:1ω9c	Barrow	42.93^{aA}	42.57^{aA}	42.47^{aA}	45.56^{aA}	44.25^{aA}	43.56^{A}	8.97	0.311	0.007	0.016
	Gilt	43.24^{aA}	43.84^{aA}	38.82^{abA}	36.67^{bB}	41.50^{abA}	40.81^{B}				
	Means	43.09	43.20	40.64	41.12	42.87	42.18				
C18:2ω6c	Barrow	11.32^{aA}	11.71^{aA}	11.96^{aA}	9.43^{aB}	9.95^{aB}	10.88^{B}	22.11	0.653	0.001	0.048
	Gilt	12.13^{aA}	11.89^{aA}	14.25^{aA}	15.83^{aA}	13.79^{aA}	13.58^{A}				
	Means	11.73	11.80	13.11	12.63	11.87	12.23				
C20:0	Barrow	0.21	0.17	0.10	0.18	0.16	0.16	75.13	0.838	0.406	0.655
	Gilt	0.10	0.16	0.14	0.15	0.15	0.14				
	Means	0.16	0.16	0.12	0.16	0.16	0.15				
C18:3ω6	Barrow	0.03	0.03	0.09	0.05	0.04	0.05	161.08	0.622	0.194	0.247
	Gilt	0.09	0.04	0.01	0.16	0.12	0.08				
	Means	0.06	0.04	0.05	0.10	0.08	0.07				
C20:1	Barrow	0.64	0.48	0.49	0.56	0.61	0.56	45.17	0.750	0.168	0.685
	Gilt	0.54	0.49	0.46	0.50	0.36	0.47				
	Means	0.59	0.48	0.48	0.53	0.49	0.51				
C18:3ω3	Barrow	0.44	0.23	0.45	0.35	0.39	0.37	51.05	0.054	0.063	0.806
	Gilt	0.61	0.32	0.45	0.43	0.58	0.48				
	Means	0.53	0.27	0.45	0.39	0.49	0.43				
C20:2	Barrow	0.35	0.18	0.32	0.25	0.28	0.28	76.57	0.637	0.341	0.836

Variable	Gender	Glycerin levels (g/kg of natural matter)					Means	CV (%)[1]	Value of P[2]		
Fatty acids		0	50	100	150	200			N	S	NxS
	Gilt	0.29	0.29	0.40	0.28	0.43	0.34				
	Means	0.32	0.24	0.36	0.27	0.36	0.31				
C20:3ω6	Barrow	0.28	0.15	0.23	0.15	0.23	0.21	92.09	0.924	0.288	0.823
	Gilt	0.21	0.27	0.33	0.27	0.27	0.27				
	Means	0.25	0.21	0.28	0.21	0.25	0.24				
C22:1ω9	Barrow	0.10	0.01	0.08	0.12	0.04	0.07	222.29	0.981	0.478	0.544
	Gilt	0.02	0.17	0.10	0.09	0.15	0.10				
	Means	0.06	0.09	0.09	0.10	0.09	0.09				
C20:3ω3	Barrow	0.04	0.09	0.03	0.05	0.04	0.05^{A}	244.37	0.586	0.036	0.993
	Gilt	0.00	0.03	0.00	0.01	0.01	0.01^{B}				
	Means	0.02	0.06	0.01	0.03	0.02	0.03				
C20:4ω6	Barrow	2.24^{aA}	1.71^{aA}	2.06^{aB}	1.62^{aB}	2.12^{aA}	1.95^{B}	40.94	0.082	0.001	0.025
	Gilt	2.41^{bA}	2.04^{bA}	3.48^{abA}	4.40^{aA}	3.28^{abA}	3.12^{A}				
	Means	2.32	1.87	2.77	3.01	2.70	2.54				
C20:5ω3	Barrow	0.02	0.08	0.05	0.07	0.02	0.05	178.51	0.606	0.683	0.209
	Gilt	0.03	0.01	0.10	0.01	0.05	0.04				
	Means	0.03	0.04	0.07	0.04	0.03	0.04				
C22:6ω3	Barrow	0.08	0.07	0.07	0.03	0.05	0.06	125.34	0.609	0.566	0.143
	Gilt	0.05	0.01	0.10	0.14	0.08	0.07				
	Means	0.06	0.04	0.09	0.09	0.06	0.07				
[a]SFA	Barrow	37.83	39.95	37.84	38.08	38.39	38.42^{A}	4.10	0.350	0.021	0.056
	Gilt	37.50	37.20	38.32	38.06	36.24	37.46^{B}				
	Means	37.66	38.58	38.08	38.07	37.31	37.94				
[b]MUFA	Barrow	47.37^{aA}	45.79^{aA}	46.89^{aA}	49.93^{aA}	48.48^{aA}	47.69^{A}	8.83	0.499	0.004	0.014
	Gilt	46.69^{aA}	47.91^{aA}	42.57^{abA}	40.41^{bB}	45.17^{abA}	44.55^{B}				
	Means	47.03	46.85	44.73	45.17	46.82	46.12				
[c]PUFA	Barrow	14.80^{aA}	14.25^{aA}	15.27^{aA}	11.99^{aB}	13.13^{aB}	13.89^{B}	23.49	0.432	0.001	0.033
	Gilt	15.82^{abA}	14.88^{bA}	19.12^{abA}	21.53^{aA}	18.60^{abA}	17.99^{A}				
	Means	15.31	14.57	17.19	16.76	15.86	15.94				
[d]Σω3	Barrow	0.58	0.47	0.60	0.49	0.50	0.53	44.28	0.183	0.269	0.631
	Gilt	0.69	0.34	0.65	0.59	0.71	0.60				
	Means	0.63	0.41	0.62	0.54	0.61	0.56				
[e]Σω6	Barrow	13.87^{aA}	13.60^{aA}	14.35^{aA}	11.25^{aB}	12.35^{aB}	13.08^{B}	23.83	0.461	0.001	0.027
	Gilt	14.84^{bA}	14.23^{bA}	18.07^{abA}	20.66^{aA}	17.45^{abA}	17.05^{A}				
	Means	14.36	13.92	16.21	15.95	14.90	15.07				
[f]Σω6/Σω3	Barrow	28.90	32.90	36.58	27.41	25.62	30.28	86.55	0.316	0.260	0.402
	Gilt	23.69	64.16	30.16	51.43	26.04	39.10				
	Means	26.29	48.53	33.37	39.42	25.83	34.69				
[g]PUFA/SFA	Barrow	0.39^{aA}	0.36^{aA}	0.40^{aA}	0.32^{aB}	0.34^{aB}	0.36^{B}	23.76	0.399	0.001	0.046
	Gilt	0.42^{abA}	0.40^{bA}	0.50^{abA}	0.57^{aA}	0.52^{abA}	0.48^{A}				
	Means	0.41	0.38	0.45	0.44	0.43	0.42				
[h]Δ9-desaturase^{C16}	Barrow	11.31^{abA}	8.98^{bB}	12.47^{aA}	11.49^{abA}	11.27^{abA}	11.10	18.25	0.617	0.181	0.037
	Gilt	10.02^{aA}	11.40^{aA}	10.23^{aA}	9.51^{aA}	10.93^{aA}	10.42				
	Means	10.66	10.19	11.35	10.50	11.10	10.76				
[i]Δ9-desaturase^{C18}	Barrow	79.54^{aA}	76.91^{aA}	78.20^{aA}	79.81^{aA}	78.67^{aA}	78.62	3.40	0.250	0.141	0.020
	Gilt	78.95^{aA}	79.23^{aA}	76.15^{abA}	74.79^{bB}	78.89^{aA}	77.60				
	Means	79.24	78.07	77.17	77.29	78.78	78.11				
[j]Elongase$^{C16-C18}$	Barrow	52.18^{aA}	50.98^{aA}	51.61^{aA}	53.39^{aA}	52.61^{aA}	52.15	5.31	0.298	0.274	0.041
	Gilt	52.81^{aA}	53.20^{aA}	49.46^{aA}	48.89^{aB}	52.50^{aA}	51.37				
	Means	52.50	52.09	50.54	51.14	52.55	51.76				
[l]Thioesterase $_{C16-14}$	Barrow	96.30	95.57	96.31	96.35	95.42	95.99	1.30	0.394	0.652	0.743
	Gilt	95.55	95.23	96.16	96.23	96.04	95.84				
	Means	95.93	95.40	96.23	96.29	95.73	95.92				

Means followed by different letters (ab) in the line indicate difference between glycerin level; (AB) columna indicate difference between sex by SNK test (α = 0,05). [1]Coefficient of variation; [2]N, S, N x S: effect of the supplementation with glycerin level, sex and its interaction, respectively; [a]Sum of SFA (C12:0 + C14:0 + C15:0 + C16:0 + C17:0 + C18:0 + C20:0); [b]Sum of MUFA (C14:1 cis-9+C16:1 cis-9+ C17:1 cis-9+C18:1 cis-9+C20:1 cis-9 + C22:1 cis-9); [c]Sum of PUFA (C18:2ω-6 + C18:3ω-6 + C18:3ω-3 + C20:4ω-6 + C20:3ω6 + C20:3ω3 + C20:5ω3 + C22:6ω-3); [d]Sum of PUFA of the n-6 series (C18:2ω-6 + C18:3ω-6 + C20:4ω-6 + C20:3ω6); [e]Sum of PUFA of the n-3 series (C18:3ω-3+ C20:3ω3 + C20:5ω3 + C22:6ω-3); [f]Ratio PUFA/SFA (C18:2ω-6 + C18:3ω-6 + C18:3ω-3 + C20:4ω-6 + C20:3ω6 + C20:3ω3 + C20:5ω3 + C22:6ω-3)/(C12:0 + C14:0 + C15:0 + C16:0 + C17:0 + C18:0 + C20:0); [g]Ratio ω-6/ω-3 (Σω-6/Σω-3); [h]Index of C16 desaturase activity=100 [(C16:1 cis-9)/(C16:1 cis-9+C16:0)]; [i]Index of C18 desaturase activity=100 [(C18:1 cis-9)/(C18:1 cis-9+C18:0)]; [j]Index of C16 to C18 elongase activity=100 [(C18:0+C18:1 cis-9)/(C16:0+C16:1cis-9+C18:0+C18:1 cis-9)]; [l]Index of C16 to C14 thioesterase activity=100 [(C16:0)/(C16:0+C14:0)].

Only the influence of the glycerin levels on the values in the loin of fatty acids C15:0 with highter means for 150g/kg (Table 2) were isolated. The gender influence on the values of fatty acids palmitic (C16:0); palmitoleic (C16:1); 11,14,17-eicosatrienoic (C20:3ω3), oleic (C18:1ω9c), Total of saturated fatty (SFA) and monounsaturated (MUFA) acids, with higher means for the barrows, were similar to that reported by Nuernberg *et al.* (2005), Tikk *et al.* (2007), Zhang *et al.* (2007), Alonso *et al.* (2009) and Mas *et al.* (2010).

The barrows had higher values of palmitic fatty acids (C16:0), palmitoleic (C16:1), C20:3ω3 and Total of Saturated Faty acids (SFA) in the loin, ham here while in the more meas of MUFA, activity of Δ9-desaturase^{C18} and Elongase $^{C16\text{-}C18}$.

For the loin, there was distinct behavior of the glycerin levels according to the gender, revealing that effect in the barrows for the fatty acid oleic (C18:0) and activity of enzyme Δ9-desaturase^{C16} with 50g/kg and 100g/kg glicerin levels, respectively. In the gilts, poorer amounts of oleic acid (C18:1ω9) were found, which showed a decrease along with the activity of the enzyme Δ9-desaturase^{C18} and Elongase$^{C16\text{-}C18}$ according to the levels of glycerin of 150g/kg in the diet, which brought about similar behavior and the reduction of the total of monounsaturated fatty acids (MUFA) compared to barrows and glicerin levels.

Interaction was verified between the glycerin levels and gender, which revealed the C15:0, PUFA, Σω6, C18:2ω6, C20:4ω6, Ratio PUFA/SFA for the 150g/kg glicerin level means for gilts (Table 2), which showed that dietary levels of glycerin interfered in the fatty acids composition of the meat of gilts in relation to the series w6 fatty acids to increase the amounts of polyunsaturated fatty acids, while in barrows this effect did not occur. In general barrows present increased lipogenesis activity than the gilts. That effect is due to the absence of anabolic stimuli, since androgens exercise a direct effect upon the musculature and estrogens promote a greater release of growth hormone and insulin-like growth factor (IGF-I), increasing the deposition of aminoacids and glucose into the muscle (Clapper *et al.*, 2000). The results found in this study may be related to the increased rate of intramuscular and subcutaneous deposition of lipids that is supported by emasculation, promoting a greater deposition of saturated fatty acids, whereas in the gilts, higher concentrations of polyunsaturated fatty acids are found in total lipids or triacylglycerols (Alonso *et al.*, 2009; Mas *et al.*, 2010).

There was an influence of the glycerin levels on the values of fatty acids identified in the ham, regardless of gender (Table 3). For the ham, greater means of the fatty acids oleic (C18:1ω9c), MUFA and Δ9-desaturase^{C18} activity were found in barrows. These results may be related to a greater activity of the enzymes Elongase$^{C16\text{-}C18}$ (Table 3) and Δ9-desaturases in the barrows meat, since this acts in the removal of hydrogen molecules of the carbonated chains of saturated fatty acids, increasing the formation of monounsaturated fatty acids cis-9, such as palmitoleic and oleic (Hayashi *et al.*, 2007; Metz *et al.*, 2009).

In the ham there was interaction between gender and glycerin level with the fatty acid palmitic (C16:0) with higher averages for barrows compared to gilts at the level of 100 and 200g/kg; whereas in gilts a change in the Thioesterase activity was observed on the glycerin level, which showed higher means for 150g/kg and they had smaller averages than barrows of 100g/kg glycerin level (Table 3). The sexual categories showed influence upon the lipid profile of the loin and ham of pigs and the results found reveal that in general the barrows presented higher values of oleic acid (C18:1ω9c) in both the cuts, while the gilts had greater means for polyunsaturated fatty acids (Linoleic (C18:2ω6c), Arachidonic (C20:4ω6)), Ratio PUFA/SFA and the series ω6, highlighting PUFA, were observed, which contributed towards the reduction of the indices of atherogenicity and thrombogenicity when as compared with the meat of the barrows (Table 4).

Table 3. Composition of the fatty acids of the swine ham according to the glycerin level of feeding and gender

Variable	Gender	Glycerin levels (g/kg of natural matter)					Means	CV[1]	Value of P[2]		
Fatty acids		0	50	100	150	200		(%)	N	S	NxS
C12:0	Barrow	0.17	0.08	0.13	0.12	0.09	0.12	124.51	0.161	0.051	0.612
	Gilt	0.07	0.02	0.16	0.03	0.02	0.06				
	Means	0.12	0.05	0.15	0.07	0.06	0.09				
C14:0	Barrow	1.09	0.91	1.09	1.09	1.24	1.08	27.39	0.153	0.767	0.105
	Gilt	0.93	1.06	1.40	0.91	0.99	1.06				
	Means	1.01	0.98	1.25	1.00	1.12	1.07				
C14:1	Barrow	0.08	0.02	0.02	0.04	0.01	0.03	159.89	0.616	0.390	0.614
	Gilt	0.05	0.06	0.04	0.04	0.05	0.05				
	Means	0.07	0.04	0.03	0.04	0.03	0.04				
C15:0	Barrow	0.07	0.07	0.09	0.08	0.09	0.08	89.34	0.220	0.166	0.404
	Gilt	0.07	0.07	0.08	0.14	0.19	0.11				
	Means	0.07	0.07	0.09	0.11	0.14	0.10				
C16:0	Barrow	23.44^{aA}	23.66^{aA}	24.16^{aA}	23.64^{aA}	24.40^{aA}	23.86	4.27	0.799	0.267	0.045
	Gilt	23.63^{aA}	23.89^{aA}	22.98^{aB}	24.36^{aA}	22.96^{aB}	23.57				
	Means	23.54	23.77	23.57	24.00	23.68	23.71				
C16:1	Barrow	3.33	2.77	3.10	3.01	3.31	3.10	23.02	0.419	0.304	0.718
	Gilt	2.94	2.81	3.31	2.59	2.94	2.92				
	Means	3.13	2.79	3.20	2.80	3.13	3.01				
C17:0	Barrow	0.44	0.44	0.32	0.56	0.32	0.42	50.39	0.463	0.791	0.059
	Gilt	0.30	0.58	0.41	0.34	0.54	0.43				
	Means	0.37	0.51	0.37	0.45	0.43	0.42				
C17:1	Barrow	0.47	0.35	0.20	0.39	0.34	0.35	90.15	0.955	0.071	0.319
	Gilt	0.12	0.30	0.28	0.17	0.26	0.23				
	Means	0.30	0.32	0.24	0.28	0.30	0.29				
C18:0	Barrow	10.00	10.74	11.33	10.54	10.73	10.67	11.83	0.384	0.067	0.256
	Gilt	11.07	11.40	11.08	12.38	10.55	11.29				
	Means	10.53	11.07	11.20	11.46	10.64	10.98				
C18:1ω9t	Barrow	0.10	0.05	0.02	0.04	0.07	0.05	185.34	0.477	0.217	0.846
	Gilt	0.04	0.02	0.03	0.01	0.05	0.03				
	Means	0.07	0.03	0.02	0.02	0.06	0.04				
C18:1ω9c	Barrow	43.37	43.22	42.87	44.75	45.17	43.88^{A}	10.79	0.692	0.001	0.961
	Gilt	40.44	38.88	39.23	39.19	41.71	39.89^{B}				
	Means	41.90	41.05	41.05	41.97	43.44	41.88				
C18:2ω6c	Barrow	12.94	13.36	12.38	11.97	10.15	12.16^{B}	19.83	0.534	0.001	0.727
	Gilt	15.23	15.20	14.88	15.22	14.83	15.07^{A}				
	Means	14.09	14.28	13.63	13.60	12.49	13.62				
C20:0	Barrow	0.18	0.15	0.12	0.12	0.15	0.14	82.14	0.232	0.330	0.248
	Gilt	0.13	0.06	0.04	0.21	0.14	0.12				
	Means	0.16	0.10	0.08	0.16	0.14	0.13				
C18:3ω6	Barrow	0.02	0.06	0.04	0.03	0.06	0.04	160.14	0.701	0.201	0.561
	Gilt	0.08	0.06	0.13	0.03	0.05	0.07				
	Means	0.05	0.06	0.08	0.03	0.05	0.06				
C20:1	Barrow	0.47	0.45	0.65	0.58	0.65	0.56	59.23	0.858	0.947	0.554
	Gilt	0.60	0.65	0.59	0.38	0.55	0.55				
	Means	0.53	0.55	0.62	0.48	0.60	0.56				
C18:3ω3	Barrow	0.29	0.45	0.35	0.30	0.34	0.35	53.57	0.312	0.369	0.617
	Gilt	0.47	0.45	0.45	0.29	0.30	0.39				
	Means	0.38	0.45	0.40	0.30	0.32	0.37				
C20:2	Barrow	0.31	0.27	0.29	0.35	0.27	0.30	66.77	0.912	0.859	0.341
	Gilt	0.28	0.35	0.38	0.16	0.36	0.31				
	Means	0.30	0.31	0.34	0.26	0.31	0.30				
C20:3ω6	Barrow	0.32	0.19	0.15	0.27	0.24	0.23	89.86	0.720	0.382	0.209
	Gilt	0.21	0.24	0.40	0.17	0.44	0.29				
	Means	0.26	0.22	0.27	0.22	0.34	0.26				
C22:1ω9	Barrow	0.08	0.04	0.00	0.00	0.15	0.05	290.53	0.466	0.707	0.287
	Gilt	0.01	0.14	0.03	0.01	0.02	0.04				
	Means	0.04	0.09	0.02	0.01	0.09	0.05				
C20:3ω3	Barrow	0.12	0.06	0.04	0.04	0.02	0.06	192.24	0.597	0.503	0.461
	Gilt	0.03	0.01	0.09	0.05	0.02	0.04				
	Means	0.08	0.04	0.06	0.05	0.02	0.05				

Variable	Gender	Glycerin levels (g/kg of natural matter)					Means	CV[1]	Value of P[2]		
Fatty acids		0	50	100	150	200		(%)	N	S	NxS
C20:4ω6	Barrow	2.38	2.30	2.39	1.90	1.40	2.07^{B}	45.74	0.399	0.001	0.969
	Gilt	3.16	3.51	3.71	3.16	2.87	3.28^{A}				
	Means	2.77	2.91	3.05	2.52	2.13	2.68				
C20:5ω3	Barrow	0.06	0.01	0.04	0.05	0.02	0.03	254.98	0.722	0.552	0.666
	Gilt	0.05	0.07	0.10	0.01	0.02	0.05				
	Means	0.05	0.04	0.07	0.03	0.02	0.04				
C22:6ω3	Barrow	0.07	0.04	0.07	0.05	0.05	0.06	131.87	0.341	0.421	0.639
	Gilt	0.06	0.02	0.14	0.08	0.06	0.07				
	Means	0.06	0.03	0.10	0.07	0.06	0.06				
[a]SFA	Barrow	35.39	36.04	37.24	36.15	37.00	36.37	5.16	0.407	0.578	0.094
	Gilt	36.20	37.07	36.15	38.36	35.41	36.64				
	Means	35.79	36.56	36.70	37.26	36.21	36.50				
[b]MUFA	Barrow	47.89	46.89	46.85	48.81	49.70	48.03^{A}	11.12	0.706	0.002	0.953
	Gilt	44.20	42.86	43.50	42.39	45.57	43.70^{B}				
	Means	46.04	44.88	45.18	45.60	47.64	45.87				
[c]PUFA	Barrow	16.50	16.75	15.74	14.96	12.54	15.29^{B}	21.96	0.458	0.001	0.827
	Gilt	19.57	19.92	20.28	19.17	18.94	19.58^{A}				
	Means	18.03	18.33	18.01	17.06	15.74	17.44				
[d]Σω3	Barrow	0.53	0.57	0.49	0.44	0.43	0.49	53.96	0.240	0.384	0.586
	Gilt	0.61	0.56	0.79	0.43	0.39	0.55				
	Means	0.57	0.56	0.64	0.43	0.41	0.52				
[e]Σω6	Barrow	15.66	15.91	14.96	14.16	11.84	14.51^{B}	22.65	0.524	0.001	0.819
	Gilt	18.68	19.02	19.11	18.58	18.19	18.72^{A}				
	Means	17.17	17.47	17.03	16.37	15.02	16.61				
[f]Σω6/Σω3	Barrow	40.48	28.72	40.08	37.79	30.38	35.49	60.57	0.702	0.164	0.367
	Gilt	37.30	38.74	32.91	52.98	59.53	44.29				
	Means	38.89	33.73	36.50	45.39	44.96	39.89				
[g]PUFA/SFA	Barrow	0.47	0.46	0.42	0.41	0.34	0.42^{B}	19.54	0.321	0.001	0.427
	Gilt	0.54	0.53	0.56	0.50	0.53	0.53^{A}				
	Means	0.50	0.50	0.49	0.45	0.43	0.48				
[h]Δ9-desaturase^{C16}	Barrow	12.42	10.47	11.31	11.28	11.83	11.46	20.98	0.363	0.450	0.559
	Gilt	11.04	10.53	12.54	9.55	11.33	11.00				
	Means	11.73	10.50	11.93	10.42	11.58	11.23				
[i]Δ9-desaturase^{C18}	Barrow	81.24	79.99	78.93	80.81	80.76	80.34^{A}	4.53	0.606	0.005	0.631
	Gilt	78.17	76.98	77.96	75.75	79.55	77.68^{B}				
	Means	79.70	78.48	78.45	78.28	80.15	79.01				
[j]Elongase$^{C16-C18}$	Barrow	54.10	53.67	52.51	54.53	54.02	53.76^{A}	6.53	0.701	0.005	0.630
	Gilt	51.57	50.27	51.18	49.73	53.16	51.18^{B}				
	Means	52.84	51.97	51.85	52.13	53.59	52.47				
[l]Thioesterase^{C16-14}	Barrow	95.58^{aA}	96.32^{aA}	96.45^{aA}	95.58^{aA}	95.23^{aA}	95.83	1.34	0.607	0.668	0.028
	Gilt	96.21^{abA}	95.74^{abA}	94.26^{bB}	96.42^{aA}	95.82^{abA}	95.69				
	Means	95.90	96.03	95.35	96.00	95.52	95.76				

Means followed by different letters (ab) in the line indicate a difference between glycerin levels; (AB) columns indicate differences between sex by the SNK test (α = 0,05). [1]Coefficient of variation; [2]N, S, N x S: effect of the supplementation with glycerin level, sex and its interaction, respectively; [a]Sum of SFA (C12:0 + C14:0 + C15:0 + C16:0 + C17:0 + C18:0 + C20:0); [b]Sum of MUFA (C14:1 cis-9+C16:1 cis-9+ C17:1 cis-9+C18:1 cis-9+C20:1 cis-9 + C22:1 cis-9); [c]Sum of PUFA (C18:2ω-6 + C18:3ω-6 + C18:3ω-3 + C20:4ω-6 + C20:3ω6 + C20:3ω3 + C20:5ω3 + C22:6ω-3); [d]Sum of PUFA of the n-6 series (C18:2ω-6 + C18:3ω-6 + C20:4ω-6 + C20:3ω6); [e]Sum of PUFA of the n-3 series (C18:3ω-3+ C20:3ω3 + C20:5ω3 + C22:6ω-3); [f]Ratio PUFA/SFA (C18:2ω-6 + C18:3ω-6 + C18:3ω-3 + C20:4ω-6 + C20:3ω6 + C20:3ω3 + C20:5ω3 + C22:6ω-3)/(C12:0 + C14:0 + C15:0 + C16:0 + C17:0 + C18:0 + C20:0); [g]Ratio ω-6/ω-3 (Σω-6/Σω-3); [h]Index of C16 desaturase activity=100 [(C16:1 cis-9)/(C16:1 cis-9+C16:0)]; [i]Index of C18 desaturase activity=100 [(C18:1 cis-9)/(C18:1 cis-9+C18:0)]; [j]Index of C16 to C18 elongase activity=100 [(C18:0+C18:1 cis-9)/(C16:0+C16:1cis-9+C18:0+C18:1 cis-9)]; [l]Index of C16 to C14 thioesterase activity=100 [(C16:0)/(C16:0+C14:0)].

In the metabolism of polyunsaturated fatty acids ω-6 and ω-3 PUFA, the desaturation and elongation reactions are mediated through enzymes desaturase and elongase (Δ4, Δ5, Δ6), resulting in the synthesis of highly unsaturated fatty acids, which afterwards are esterified into phospholipids and will go to constitute the cell membranes, contributing to its fluidity, in addition to being precursors of prostaglandins, thromboxanes and leukotrienes (Nakamura and Nara, 2004). As the affinity of enzyme Δ6 desaturase is greater for fatty acids ω-3, it will need smaller amounts of these in relation to ω-6 for the production of the same amount of the product (Palmquist, 2009). Thus, in this work, in both cuts of swine gilts' meat, we found a greater amount of the fatty acids linoleic (C18:2ω6c) and arachidonic (C20:4ω6) (Table 2.3). These results suggest that in the gilts there is possibly a poorer activity of Δ6 desaturase and consequent greater activity of Δ5 desaturase, where as in the Barrows that behavior would be inverse, since smaller amounts of linoleic acid and greater of 11,14,17-Eicosatrienóico (C20:3ω3) were found in these animals.

The sows' meat presented higher proportions of polyunsaturated fatty acids in relation to the saturated ones (PUFA/SFA) for both the cuts (Table 2.3) according to the glycerin level of 150g/kg in the diets in the loin for the total of polyunsaturated fatty acids, the series ω6, arachidonic acid with an average superior proportion of 1.79 as high as this component in relation to the amount found in the barrows. This behavior can be related to increased activity of the enzymes desaturase (Δ6) and elongase in gilts, since the increase of the glycerol levels would promote greater synthesis of triglycerides, these being utilized for the production of polyunsaturated fatty acids in this category, while for the barrows there would be greater formation of SFA (Nuernberg *et al.* (2005).

No effect of the use of crude glycerin and sexual category upon the values of cholesterol in the loin of 87.25mg/100g was found (Table 4), while for the ham, there was interaction between these two factors, presenting an average value of 84.75mg/100g. Those results are superior to the ones reported for pork in both the cuts (42mg/100g for loin and 49mg/100g for the ham) by Bragagnolo and Rodrigues-Amaya (2002).

Table 4. Mean of the index and cholesterol according to the level of glycerin and gender in the muscle *Longissimus dorsi* (loin) and *Semimembranosus* (ham)

Variable	Gender	Glycerin levels (g/kg of natural matter)					Means	CV (%)[1]	Value of P[2]		
		0	50	100	150	200			N	S	NxS
Loin											
[a]Atherogenicity	Barrow	0.55^{aA}	0.56^{aA}	0.54^{aA}	0.58^{aA}	0.57^{aA}	0.56^{A}	9.77	0.224	0.001	0.050
	Gilt	0.55^{aA}	0.55^{aA}	0.50^{abA}	0.46^{bB}	0.50^{abB}	0.51^{B}				
	Means	0.55	0.56	0.52	0.52	0.54	0.54				
[b]Thrombogenicity	Barrow	1.14	1.27	1.14	1.17	1.19	1.18^{A}	6.73	0.131	0.007	0.077
	Gilt	1.13	1.14	1.16	1.14	1.06	1.13^{B}				
	Means	1.14	1.20	1.15	1.15	1.12	1.15				
Cholesterol (mg/100g)	Barrow	77.23	98.29	69.14	91.87	95.56	86.42	31.14	0.295	0.813	0.465
	Gilt	92.29	102.81	83.50	87.03	74.78	88.08				
	Means	84.76	100.55	76.32	89.45	85.17	87.25				
Ham											
[a]Atherogenicity	Barrow	0.54	0.52	0.54	0.55	0.59	0.55^{A}	9.11	0.349	0.001	0.480
	Gilt	0.50	0.50	0.51	0.49	0.50	0.50^{B}				
	Means	0.52	0.51	0.53	0.52	0.55	0.52				
[b]Thrombogenicity	Barrow	1.03^{aA}	1.07^{aA}	1.13^{aA}	1.08^{aB}	1.14^{aA}	1.09	8.30	0.370	0.725	0.040
	Gilt	1.08^{aA}	1.12^{aA}	1.06^{aA}	1.19^{aA}	1.05^{aA}	1.10				
	Means	1.06	1.09	1.09	1.13	1.09	1.09				
Cholesterol (mg/100g)	Barrow	92.54^{abA}	74.19^{abA}	61.78^{bB}	107.89^{aA}	85.85^{abA}	84.45	29.66	0.075	0.926	0.020
	Gilt	62.92^{bB}	75.54^{abA}	94.18^{abA}	87.74^{abA}	104.87^{aA}	85.05				
	Means	77.73	74.86	77.98	97.82	95.36	84.75				

Means followed by different letters (ab) in the line indicate a difference between glycerin level; (AB) columns indicate differences between sex by SNK test (α = 0,05). [1]Coefficient of variation; [2]N, S, N x S: effect of the supplementation with glycerin level, sex and its interaction, respectively. [a]Index of atherogenicity = [4(C14:0) + C16:0]/(Sum SFA + Sum PUFA); [b]Index of thrombogenicity = (C14:0 + C16:0 +C18:0) / [(0.5xΣMUFA) + (0.5xΣω6) + (3xΣω-3) + (Σω-3/ω-6)].

In the ham there was an interaction between the levels of glycerin and gender for the amount of cholesterol in the meat (Table 4). For the gilts, there was an effect and the amount of cholesterol increased according to the level of glycerin in the diet, while in the barrows high means were found in the 150g/kg.

This increase in the amount of cholesterol in the meat of the gilts according to the dietary glycerin level may be related to the increased need of synthesis of progesterone and/or estradiol, since from cholesterol sex hormones are synthesized. The process of biosynthesis of cholesterol and triacylglycerols is similar and depends on a source of glicerol-3-phosphate (glicerol-3-P), which is obtained through the action of the enzyme glycerol kinase upon glycerol, with further production of pyruvate, where this is utilized to produce acetyl-coA, which is the precursor for the cholesterol synthesis (Boyle, 2005). As in the barrows, there is no production of steroid hormones, possibly the different amounts of glycerol fed in the diet determine that range since acetyl-coA can be utilized for synthesis of other compounds as lipids, ketone bodies and energy production via the Krebs cycle.

Considering the nutrient allowances of the World Health Organization (World Health Organization, 2003) stating that the PUFA/SFA ratio should be higher than 0.4; it is found in this work that in both the cuts, the gilts presented better results (Table 4) and that only in the loin of barrows no values above that index were found. For human diets, a consumption proportion of 4:1 in relation to the fatty acids ω6/ω3 is desirable. Nevertheless, in the meat of the animals in this study the results showed average values of ω6/ω3 ratio of 34.69 in the loin and of 39.89 in the ham, which stands for 9 to 10 times the recommended, which constitutes a risk factor for the development of certain types of cancer and heart diseases if considering only its consumption (World Health Organization, 2003).

According to Wood *et al.* (2003), this is one of the undesirable aspects of pork, brought about by the high amount of linoleic acid present in the ingredients of the feeds which are given in the raising system, which has led many workers to seek alternatives such as the supplementation in swine feeding with soil sources rich in w3 (Nuernberg *et al.*, 2005; Tikk *et al.*, 2007), conjugated with linoleic acid (Martin *et al.*, 2008) and monounsaturated fatty acids (Mas *et al.*, 2010, Realini *et al.*, 2010) .

The determination of the indices of atherogenicity and thrombogenicity in the loin showed the poorest indices for the meat of barrows; while in the ham there was a difference for the index of atherogenicity with best results for the gilts (Table 4). These indices are related to the amounts of saturated, polyunsaturated fatty acids and those of the series ω6, being a health indicator associated with the risk of cardiovascular disease according to the lipid composition of the food (Turan *et al.*, 2007). In that way, the lower the indices of atherogenicity and thrombogenicity of a given products are, the better its consumption will be for one's health.

The indices of atherogenicity and thrombogenicity found in this work are similar to the results reported by Tonial *et al.* (2010) for salmon (0.56 and 0.23) and lower than the ones cited by Arruda *et al.* (2012) for lambs (0.64 and 1.37), demonstrating in that way characteristics intermediary to the meat of the two species.

In general, regardless of the gender and cut, the meat of the pigs fed crude glycerin offered characteristics favorable to its consumption, since gilts presented higher values of polyunsatured fatty acids and barrows presented higher values of monounsaturated fatty acids, mainly oleic acid which aids in the reduction of serum cholesterol, possesses anti-thrombogenic effect and inhibits the platelet aggregation.

CONCLUSION

The use of glycerin in swine feeding promoted modification in relation to the lipid profile, promoting modifications in the deposition of fatty acids, with higher amounts of glycerin in swine feeding promoting modifications regarding the lipid profile, promoting modifications in the fatty acid deposition with greater amounts of saturated and monounsaturated acids in the barrows meat and polyunsaturated acids and cholesterol in the sows.

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