FAT ACID PROFILE OF THE CAPYBARA (*HYDROCHAERIS HYDROCHAERIS* L.1766) COMMERCIAL CUTS

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Background

Among the components of the meat (water, protein, fats and minerals), the lipids show a wide variety (fat acids (FA)) saturated and unsaturated, cholesterol, phospholipids and fat soluble vitamins and wide variation in the amount. In order to reduce the ingestion of harmful FA and to keep the meat in the human diet, the current researches look for: a) to identify in the species of butcher's shop slaughtered ages and genotype with lower percentile of total lipids (TL) and FA profile that avoid the harmful components to the human health; b) to determine the effect of the rations enrichment with oils containing FA ω3 on the profile of FA in the meat; and c) to identify species with low amount of lipids (JARDIM, 2001). The wild animals produce meat with reduced content of lipids, cholesterol and high proportions of polyunsaturated FA when compared to the domestic animals (SINCLAIR & O'DEA, 1990). However, in capybaras, the determination and quantification studies of the different fat acids are scarce.

Objectives

The objective of the present work was to analyze the fat acid profile in the different commercial cuts of the capybaras meat.

Material and methods

Animals: The total of 5 adult capybaras (55-74kg), males and females, coming from captivity, fed with napier and supplemented with corn and soybean meal *ad libitum* were slaughtered and the half carcasses cooled to 5°C. I the 24h *post mortem* the commercial cuts were done (SANTOS, 1999). From the cuts the samples were collected (without subcutaneous fat and connective tissue), homogenized, identified and frozen at -20°C.

Chemical analysis: The TL were determined by Soxhlet (A.O.A.C., 1990), in triplicates. The lipids were extracted according to FOLCH et al. (1957) and determined by gaseous chromatography (gas chromatograph, 17A Shimadzu), equipped with capillary column DB-WAX polyethylene-glycol (30m; 0.25mm; 0.20μm). The chromatograph conditions were: initial temperature of the column: 180°C; final temperature of the column: 240°C; programming rate (Ratio): 5°C/min; split in the ration 1:5; injector's temperature: 230°C; and detector's temperature: 250°C.

Statistical analysis: The experimental design was in randomized blocks and the statistical program was Sisvar (FERREIRA, 2000).

Results and discussion

The averages for TL ranged from 0.36 to 1.25% **(table 1)** with overall average of 0.85% (85mg/100g). In capybaras, similar results were described by JARDIM (2001) in the loin (0.82g/100g) and for ROÇA et al. (1996) in copa (0.91g/100g). However, SALDANHA (2000) described higher values (1.6g/100g). This amount of TL resembles to those averages verified in kangaroo (SINCLAIR AND O'DEA, 1990). In conventional species, higher averages are described by BRAGAGNOLO (1995) in bovine rump steak (2.5g/100g) and in swine loin (3g/100g).

The statistical analysis revealed variations among cuts ($P < 0.05$) for the FA: C16:0; C16:1ω7, C18:1ω9; C20:4ω6 and C22:4ω6 and the others FA showed similar results among cuts **(table 1)**. In quantitative terms (%), the FA that showed larger proportion in decreasing order were: C16:0 (27.64 to 42.02); C18:1ω9 (17.97 to 35.74); C18:2ω6 (12.10 to 23.21); C20:4ω6 (5.79 to 12.81); C18:0 (6.83 to 9.52); C18:2ω9 (3.61 to 6.01); C14:0 (1.66 to 3.04); C18:3ω3 (1.00 to 1.27); C16:1ω7 (0.37 to 2.56); C22:4ω6 (0.35 to 0.89); C20:5ω3 (0.11 to 0.59); C18:3ω6 (0.20 to 0.32); C20:1ω9 (0.18 to 0.29) and C22:6ω6 (0.10 to 0.24).

The averages of the C16:1ω7 (palmitoleic) were different ($P< 0.01$) among cuts. The cut chest-plati showed higher average (2.56) than the hind leg (0.37) and the loin (0.91), however the palette and the carré showed intermediate values (1.22 and 1.14, respectively). The PFA C20:4ω6 and C22:4ω6 show variations ($P<0.05$) when compared to the cuts. The C20:4ω6 (araquidonic acid) showed superior average in the hind leg (12.81%) than in the chest-plati (5.79%), however those values were similar to the loin (11.18%), palette (5.87) and carré (8.80%) averages. Similar behavior was verified for C22:4ω6 with superior average in the hind leg (0.89%,) in relation to the chest-plati (0.35%) and these results were similar to the averages in the loin (0.73%), paleta (0.45%) and carré (0.55%). Considering the different concentration of C20:4ω6 and C22:4ω6 FA in the different cuts it is possible to suppose that: a) the muscles that compose the different cuts show different amounts of these FA in the composition of membranes, possibly resulted of the difference in the composition of the muscle in relation to the types of fibers that are of the glycolytic, glycolytic-oxidative or oxidative type (ALASNIER, 1996); b) the muscles that compose the different cuts show different requirements in FA of the ω6 family, considering that the muscles composition differs in relation to the fiber type that show different organic functions and metabolism; and c) the muscles that compose the different cuts show different composition of membranes and different requirements of FA ω6.

Regarding to the FA ω3 (without significant difference), C18:3ω3 (α-linolenic, precursor of the FA C20:5ω3 and C22:6ω3) was the most abundant FA with variations from 1 to 1.27%. In capybaras higher values (4.39 to 5.85%) were reported by ODA (2002) and lower values (0.24 to 0.47) by JARDIM (2002). However SALDANHA (2000) found averages of 1.73% similar to the results of the present work. The difference among authors can be attributed the different diets ingested by the monogastric animals (ROSA, 2000). The total of PFA ranged from 24.89 to 43.32%. In capybaras variations from 25.36 to 35.41% are described (SALDANHA, 2000; JARDIM, 2001 and ODA, 2002). In butcher's shop species: sheep, goat and bovine are reported averages from 5.36 to 12.54% (Bragagnolo, 1995). These variations among animals can be attributed to the feed type and the to digestive physiology. The average values for ω3 and ω6 ranged from 1.44 to 2.0% and 18.48 to 37.11%, respectively. These results are similar to that reported by ODA (2002) regarding ω6, but inferior for ω3 (5.73%) and for ω6 (25.95%). SALDANHA (2000) mentions variations for FA ω3 from 0.8 to 3.3% in the loin and palette of capybaras. According to FAO recommendations (1994) the relationship of FA of the family ω6 and ω3 should be of 3-4:1. These relationships were calculated for the commercial cuts, and the smallest found value was of 10.95% for chest-fralda and the largest of 23.19% for the palette.

Conclusions

The fat acids C16:0 (SFA), C16:1ω7 (MFA), C18:1ω9 (MFA), C20:4ω6 (PFA) and C22:4ω6 (PFA) showed different values among cuts.

References

ALASNIER, C.; REMINGN, H.; GANDEMER, G. Lipids characteristics associated with oxidative and glycolytic fibres in rabbit muscle. Meat Science, V 43, n.3-4, 213-224. 1996.

ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS. Official Methods of Analysis of the Association of Official Analytical Chemists. 15ed., Arlington, AOAC, 1990.

BRAGAGNOLO, N. e RODRIGUEZ-AMAYA, D.B. Teores de Colesterol em Carne Suína e Bovina e Efeito do Cozimento. Ciência e Tecnologia de Alimentos, v.15, n.1, p.11-17, 1995.

FAO / WHO . Report of a joint expert consulation : fats and oils in human nutrition . Food and Nutrition Paper , Rome , v. 57 , n. 1 , p. 49-55 , 1994 .

FERREIRA, D. F. Análises estatísticas por meio do Sisvar versão 4.0. In... 45ª Reunião Anual da Região Brasileira da Sociedade de Biometria. UFSCAR, São Carlos, SP, julho de 2000. P.255-258.

FOLCH, J.; LEES, M.; SLOANE-STANLEY, G.H. A simple method for the isolation and purification of total lipids from animal tissue. Journal of Biological Chemistry. n.226, p.497-509, 1957.

GARCIA, P .T . ; CASAL , J . J . Contribution of poultry lipids to corrent recommendation for an optimum lipid dietary intake . On : INTERNATIONAL CONGRESS OF MEAT SCIENCE AND TECHNOLOGY , 45. , 1999 . Anais ... Yokohama : ICOMST , 1999 .

JARDIM, N. S. Sexo e diferentes pesos ao abate na qualidade da carne de capivara (*Hydrochaeris hydrochaeris* L. 1766). Lavras: UFLA, 2001. 119p. (Dissertação de mestrado em Ciência de Alimentos).

ODA, S. H. I. Diferentes métados de abate e sexo na qualidade da carne de Capivara *(hydrochaeris hidrochaeris* L. 1766) . Lavras: UFLA , 2002. 145p. (Dissertação de mestrado em Ciência dos Alimentos) .

SALDANHA, T. Determinação da composição centesimal nos diferentes cortes da carne de capivara (*Hydrochoerus hydrochaeris*). Rio de Janeiro: UFRRJ, 2000. 105p. (Dissertação de Mestrado)

SANTOS, C. L. Estudo do desempenho, das características da carcaça e do crescimento alométrico de cordeiros das raças Santa Inês e Bergamácia. Lavras, 1999. 143p. Dissertação (Mestrado em Zootecnia) – Universidade Federal de Lavras.

SINCLAIR, A.J.; O'DEA, K. Fats in Human diets through history: is the western diet out of step? In: WOOD, J.D.; FISHER, A.V. Reducing fat in meat animals. London:Elsevier, p.1-47, 1990.

TABLE 1. Average ± standard error (se) of total lipids (TL), saturated fat acids (SFA), monounsaturated fat acids (MFA), polyunsaturated fat acids (PFA), total of ω3 and ω6 polyunsaturated fat acids and the ration ω3/ω6, in percentage of total lipids found in capybara commercial cuts.

		Hind leg (Average ±se)	Chest – Plati (Average ±se)	Loin (Average ±se)	Palette (Average ±se)	Carré (Average ±se)
TL		0,36±0,32	1,25±0,32	0,83±0,32	0,60±0,32	1,18±0,32
SFA	C 14:0	1,66±0,41	3,04±0,40	1,80±0,40	2,17±0,40	2,47±0,40
	C 16:0	27,64±2,31^{b}	35,23±2,31^{ab}	42,021±2,64^{a}	34,21±2,31^{ab}	32,07±2,31^{ab}
	C 18:0	9,06±1,12	7,85±1,28	8,09±1,28	9,52±1,12	6,83±1,12
	Total SFA	38,36	46,32	51,90	45,90	41,37
MFA	C 16:1(7	0,37±0,36 ^{b}	2,56±0,36 ^{a}	0,91±0,36 ^{b}	1,22±0,36 ^{ab}	1,14±0,36 ^{ab}
	C 18:1(9	17,97±2,79 ^{b}	35,74±2,79^{a}	29,31±2,79^{ab}	26,27±2,79^{ab}	26,95±2,79^{ab}
	C 20:1(9	0,26±0,06	0,20±0,06	0,29±0,06	0,18±0,06	0,23±0,06
	Total MFA	18,60	38,50	30,51	27,67	28,32
PFA	C 18:2(9	3,61±0,65	4,70±0,65	6,01±0,65	4,50±0,65	4,28±0,65
	C 18:2(6	23,21±2,72	12,10±2,72	16,77±2,72	20,28±2,72	17,52±2,72
	C 18:3(6	0,20±0,05	0,25±0,05	0,31±0,05	0,32±0,05	0,25±0,05
	C 18:3(3	1,27±0,18	1,00±0,18	1,17±0,21	1,16±0,18	1,12±0,18
	C 20:4(6	12,81±1,50^{a}	5,79±2,04^{b}	11,18±1,73^{ab}	5,87±1,50^{b}	8,80±1,50^{ab}
	C 20:5(3	0,19±0,17	0,59±0,44	0,59±0,20	0,11±0,20	0,28±0,17
	C 22:6(3	0,14±0,01	0,10±0,02	0,24±0,02	0,17±0,02	0,17±0,01
	C 22:4(6	0,89±0,11^{a}	0,35±0,12^{b}	0,73±0,12^{ab}	0,45±0,11^{ab}	0,55±0,1^{1ab}
	Total PFA	43,32	24,89	67,51	32,86	32,97
	Total of ω3	1,60±0,14	1,69±0,14	2,00±0,14	1,44±0,14	1,57±0,14
	Total of ω6	37,11±0,94^{a}	18,48±0,94^{b}	28,99±0,94^{ab}	26,92±0,94^{ab}	27,12±0,94^{ab}
	ω3/ω6	23,19	10,95	14,50	18,69	17,27

^{ab} Average followed by different letter differ significantly (P<0.05)