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Lipids and fatty acids in roasted chickens

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SUMMARY. Total lipids from meat portions of breast, thigh, wing, side and back with and without skin from 10 roasted chickens were extracted with chloroform and methanol and gravimetrically determined, and their fatty acids were analysed as methyl esters by gaseous chromatography, using a flame ionization detector and capillary column. The main fatty acids found were: C16:0, C18:1ω9, and C18:2ω6. The average ratio observed between PUFA/SFA was of 0.98, mainly due to the great concentration of the C18:2ω6 fatty acid, with an average of 26.75%. Regarding to the lipids content, the skinless breast showed the lowest content, 0.78g/100g, while the back with skin was the one with the highest content, 12.13g/100g, except for the pure skin, with 26.54 grams of lipids by 100 grams.
Key words: Roasted chicken, lipids, fatty acids.

RESUMEN. Lipidos y ácidos grasos en pollos asados. Los lípidos totales de porciones de carne de pecho, piernas, alas, lateral y espaldas, con y sin piel, de 10 pollos asados, fueron extraídos con cloroformo y metanol, determinandolos gravimetricamente. Los ácidos grasos se determinaron como ésteres metílicos por cromatografía gaseosa, usando detector de ionización de llama y columna capilar. Los principales acidos grasos encontrados fueron: C16:0, C18:1ω9 y C18:2ω6. La relación media observada entre P/S fue de 0,98, principalmente debido a gran concentración de C18:2ω6, con una media de 26,75%. Considerando la cantidad de lípidos, el pecho sin piel presentó la menor cantidad, 0,78g/100g, mientras que la espalda con piel fue la parte que mostró la mayor cantidad de lípidos, 12,13g/100g, con exepción de la piel pura, con 26,54g de lípidos por 100g.
Palabras clave: Pollo asado; lípidos, ácidos grasos.

INTRODUCTION

The increase in consumption of poultry meat during recent years has caused a growing interest among nutricionists and dietitians in the nutritional and physiological aspects of lipids and their polyunsaturated fatty acids contents.

The production of broiler poultry in Brazil has substantially increased in the past 5 years. Many different commercial strains and crosses of broilers have been developed, most of which have a fast growth rate and some have a high carcass yield (6,7,13). Consumers have become increasingly aware of the health quality of the foods they consume. Lipid composition, in particular, has been a primary area of consumer concern due to an increased awareness of the link between both the amount and composition of fat coronary heart disease and certain forms of cancer (8).

It is known that lipids in meat contain palmitic, stearic, palmitoleic and oleic acid as major components. These major fatty acids accelerate the aggregation of platelets and coagulation in blood vessels. Linoleic acid, however, inhibits thrombosis in the arterial blood vessels.

This study presents data on the investigation of fatty acid composition and amount of total lipids in roasted chickens.

MATERIAL AND METHODS

Sampling

Randomly sampling of ten commercial cut chickens, roasted in eletric baker with rotating spit were adquired in several commercial establishments of the city of Maringa (PR), Brazil. The origin, strain, age, sex and how the analyzed chickens were fed was not known, nor was the time or the temperature used to bake them in the electrical baker.

Methods

Roasted chickens were submitted to the breast with sternum cut, according to Beraquet et al. (4) and deboned. All chicken portions (wings, sides, breast, back and thigh) were analyzed with and without skin.

Aliquots (30g) in triplicate, of the samples were individually homogeneized in 90ml, 2 chloroform: 1 methanol (v:v) according to the method of Bligh and Dyer (5) as modified by Kinsella et al. (11). The resulting lipid fraction was weighed.

Methyl esters were prepared by transmethylation according to the procedure of the ISO (9), using KOH 2 $mol.l^{-1}$ in methanol and n-heptane. Fatty acids methyl esters (FAME) were analyzed using a Shimadzu 14A (Japan) gas chromatograph equipped with flame ionization detector and fused silica capillary column (50 m x 0.25 mm and 0.20 µm of Carbowax 20M). Column temperature was programmed at 10°C.min^{-1} from 150-240°C.

The injection port and detector were maintained at 220°C and 245°C, respectively. Carrier gas was hydrogen (1.2 ml.min^{-1}) and the make up was nitrogen (30 ml.min^{-1}). The split used was 1:100. Identification of normal fatty acids was made by comparing the relative retention times of FAME peaks from samples with standards from SIGMA (USA). The peak areas were determined by the CG-300 Computing integrater (CG Instruments, Brazil). Data were calculated as normalized area percentages of fatty acids.

RESULTS AND DISCUSSION

Table 1 summarizes our finding of lipids, fatty acids composition and PUFA/SFA ratio on roasted chickens. The lipid concentration in some pieces, such as back and wing was much higher (=12%) than in all other analyzed pieces. Values around 4% were found for side and 2% for breast. The lipid content for the pure skin was of 26.54%. As expected (1,10), total lipid content was lowest in the white meat, followed by dark meat and skin. For the samples analyzed without skin, there was a decrease of aproximately 50% in the lipid content.

TABLE 1
Total lipids (%), fatty acids (expressed as percent of total fatty acid methyl esters) composition and PUFA/SFA ratio in roasted chickens

Pieces	Lipids	C14:0	C16:0	C16:1ω-7	C18:0	C18:1ω-9	C18:2ω-6	C18:3ω-6	C20:0	PUFA/SFA
Wing*	11.13±2.33	0,39± 0.09a	19.04±1,25a	5.18±0,73a	5.92±0,40a	39.22±3,18a	27.70±3,09a	1.89 ±0,35a	0.79±0,16a	1.13
Wing**	5.72±2.14	0,40±0,07a	19.77±1,15a	4.85±0,68a	6.63±0,64a	38.01±2,79a	27.16±2,98a	1.78 ±0,45a	1.32±0,24a	1.03
Thigh*	6.45±1.32	0,42±0,09a	19.43±1,13a	4.89±0,67a	6.44±0,48a	38.13±2,91a	27.60±2,71a	1.86±0,47a	1.15± 0,21a	1.07
Thigh**	3.70±1.41	0.43±0,08a	19.77±1,34a	4.91±0,89a	6.86±0,37a	37.57±2,44a	27.44±2,52a	1.77±0,34a	1.38±0,25a	1.03
Back*	12.13±1.93	0.44±0,05a	19.70±1,23a	4.84±0,56a	6.73±0,89a	37.89± 2,89a	27.59±2,26a	1.81±0,28a	1.18±0,17a	1.05
Back**	7.12±1.22	0.39±0,08a	19.41±1,53a	4.55±0,67a	6.67±0,41a	38.06±3,12a	27.91±2,06a	1.90±0,54a	1.10±0,19a	1.08
Side*	4.47±2.54	0.42±0,05a	19.91±1,29a	4.52±0.79a	6.39± 0,85a	38.41±3,03a	27.14± 2,61a	1.77± 0,43a	1.08±0,31a	1.04
Side**	2.56±1.11	0.46±0,07a	20.93±1,20a	4.17±0,90a	8.10 ±0,55b	36.41±2,92b	25.65±2,38a	1.50±0,27a	1.96±0,19b	0.8€
Breast*	1.65±0.41	0.53±0,38a	20.03±1,45a	4.33±0,73a	7.62±0,45b	35.69±3,01b	26.16±2,02a	1.62±0,30a	2.22±0,26b	0.91
Breast**	0.78±0.21	0.35±0,07b	21.46±1,78a	2.79±0,56b	11.59±0,71c	29.32±3,39c	23.15±2,41b	1.10±0,23b	2.43±0,25b	0.68
Skin	26.54±4.92	0.44±0.08a	21.94±1.32a	5.43±0.79a	5.61±0.70a	39.83±2.86a	26.69±2.15a	1.84±0.45a	0.49±0.12c	1.00

*Portion with skin; **Portion whithout skin; All results are means of three determinations in ten samples. PUFA=Polyunsaturated Fatty acids; SFA= Saturated fatty acids; Means value within the same column followed by different letters are significant different (P<.05).

The fatty acids are ordered according to their chromatographic retention time, and the values are given as weight percent of total fatty acid methyl esters. The data show that the amount of constituent fatty acids did not vary among the pieces. Except for the breast meat that shows significant differences among the fatty acid concentration, showing higher saturated fatty acid concentration and lower insaturated fatty acid concentration, in relation to the analyzed portions. Sahasrabudhe et al. (15) analyzed white and dark chicken meats and found out that dark meat has higher insaturated fatty acids concentration. Table 1 also shows that palmitic acid (C16:0) is the predominant saturated fatty acid. The saturated fatty acids accounted for 26 to 36% of the total fatty acids. The fatty acid which had the highest concentration was the oleic acid (C18:1ω9) with a variation from 39.32% for the skinless breast to 39.83% for the skin. The highest polyunsaturated fatty acid was the linoleic acid (C18:2ω6) with a variation from 23.15% for the skinless breast to 27.91% for the skinless back.

The polyunsaturated to saturated fatty acids (PUFA/SFA) ratio is sometimes considered an important characteristic of food fats. The PUFA/SFA ratio was calculated as the sum of the percentage of all acids with two or more double bonds divided by the sum of all saturated acids. There is not a significant difference in the PUFA/SFA ratio for the analyzed samples and the average value was of approximately 1.00, which is a very high value when compared to red meats. This value is equal or superior to the values found for freshwater fish in the South of Brazil (2). Chicken breast meat can be considered a good quality meat, because its lipid content is very low even though its value for PUFA/SFA was low.

In conclusion, considering the lipid content in bovine, suine, lambs (12) and some fish (2,3) meat and the PUFA/SFA ratio, the roasted chicken meat can be considered lean and therefore suitable for diets. However, the chicken meat must be eaten with moderation, due to its high cholesterol content, which is higher than bovine and suine meat (14).

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