

NUTRIENT CONTENT OF DOVE MEAT FROM THE PROVINCE OF CHACO, ARGENTINA

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Abstract

The diet of inhabitants of the province of Chaco (Argentina) is built on the basis of wild fauna. Doves, which constitute a plague for cultivated fields, are used as dietary supplement. Food composition tables do not contain information on nutritional quality of these species of regional origin. In this paper we analyze the composition of macronutrients and main mineral components of muscular tissue of *Zenaida auriculata*, *Columba picazuro* and *Leptotila verreauxi* species. The quality of lipids was determined by gaseous chromatography of its methyl esters. These meats show a protein content of 18 - 21%, and total lipids content of 0.72 - 1.24 %. Potassium levels were found to be 16- 24 mg/100 g breast, and sodium levels from 15 to 20 mg/100 g of breast, lower than average values for bovine meat. The contribution of polyunsaturated fatty acids overcame saturated fatty acids in the lipidic fraction of muscle. The contribution of essential fatty acids is above 20% of the lipid fraction for linoleic (18:2 n-6) fatty acid for the three species. Contribution of linolenic fatty acid (18:3; n-3) is 15% for *Leptotila verreauxi*. Contribution of arachidonic acid (20:4 n-6), semiessential, is 8 to 12% of the lipid fraction. The content of n-6 fatty acids was found to be 37 to 47 % of lipids in the three species; however n-3 fatty acids are present in a low percentage (2-3,9 %) in *Zenaida auriculata* and in *Columba picazuro*, and 17 % in *Leptotila verreauxi*. Low cholesterol levels (< 0.1 % mean) completed a fatty acid profile of high nutritional quality.

Keywords: dove meat, macronutrients, fatty acid profile, nutritional quality.

Resumen

Los habitantes de las zonas rurales de la provincia del Chaco (Argentina) basan parte de su alimentación en ejemplares de la fauna silvestre. Las palomas, que muchos consideran una plaga de los sembradíos, son muy utilizadas con este fin. Las tablas de composición de alimentos no cuentan con información acerca de la calidad nutricional de estas especies de origen regional. En este trabajo se analiza la composición de macronutrientes y principales componentes minerales de la pechuga de palomas de las especies *Zenaida auriculata*, *Columba picazuro* y *Leptotila verreauxi* y se determina la

calidad de los lípidos presentes por cromatografía gaseosa de sus ésteres metílicos. El contenido proteico de estas carnes se encuentra entre 18 a 21%, mientras que los lípidos están entre 0,72 y 1,24%. Los niveles de sodio son del orden de 15– 20 mg/100 g de pechuga, inferiores a los valores promedio en carne bovina; y los de potasio están entre 16- 24 mg/100 g de pechuga. En la fracción lipídica del músculo, la contribución de ácidos grasos poliinsaturados supera a la de los saturados. El aporte de los ácidos grasos esenciales: linoleico (18:2; n-6) está por encima del 20% de la fracción lipídica para las tres especies estudiadas y el del linolénico (18:3; n- 3) es del 15% para *Leptotila verreauxi*. El araquidónico (20:4; n-6), semiesencial, constituye entre 8 – 12% de los lípidos. El contenido de ácidos grasos n-6 es elevado y está en el orden del 37 al 47% de los lípidos en las tres especies; sin embargo los n-3 están presentes en un bajo porcentaje (2- 3,9%) en *Zenaida auriculata* y *Columba picazuro* y son del orden del 17% en *Leptotila verreauxi*. Los bajos niveles de colesterol (< 0.1% en promedio) completan un perfil lipídico de elevada calidad nutricional.

Palabras claves: carne de paloma, macronutrientes, perfil de ácidos grasos, calidad nutricional.

Introduction

The very rich wild fauna of the Province of Chaco provides with meat and eggs for consumption in rural areas. Favored by crops cultivation, several types of doves have increased their population, representing a great demographic explosion [1].

The expansion of agricultural borders though deforestation has benefited medium size doves (*Zenaida auriculata*). These doves, provided they have food, become gregarious. They assemble in large "resting- places" and are able to reproduce practically all year round [2].

Research is the way to examine the feasibility of initiating a commercial stage for the invasive doves of Chaco. Information on the nutrient composition is needed to facilitate the processing, utilization and marketing of added- value dove products.

This project is based on the study of eatable portions of these doves as dietary supplement, which either fresh or processed, could be potentially traded and exported. For this work we used dove breasts.

Several papers [3 - 15] report that meats from wild animals are of very high nutritional quality due to their low fat contents and considerably high levels of polyunsaturated fatty acids, mainly those of the n- 3 [16- 17] and n-6 families [18- 19].

We evaluated those variables affecting the nutritional quality of dove meat: water content, total proteins, total lipids, ashes, sodium and potassium levels and fatty acids profile.

Materials and Methods

Samples: groups of six samples each one of species *Zenaida auriculata*, *Columba picazuro* and *Leptotila verreauxi* were captured by hunt habitual technique in the territory of Chaco, mainly in the southwest zone of the province. Breast is the most commonly consumed dove part. It represents approximately 35% of the total weight of the specimen. Sampling zones are indicated in figure 1.

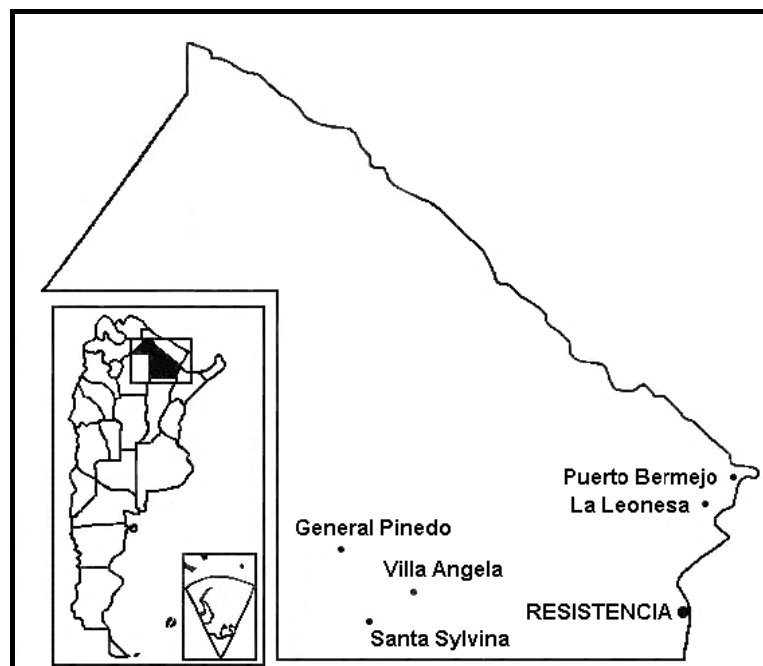


Figure 1. Sampling zones in province of Chaco (Argentina).

Once samples were in the laboratory, they were weighed and measured, they were feather plucked and breasts were separated. Skin, fat, bones and tendons were removed. The meat was minced. An aliquot was separated for the determination of water content and the rest of the meat was preserved in freezer (-18°C) until analysis were made.

Reagents: for physical-chemical determinations reagents of analytic quality were used. For chromatography, Merck chromatographic standards were used: methyl octanoate, methyl myristate, methyl oleate, methyl palmitate, methyl laurate, methyl decanoate and Sigma chromatographic standards: arachidonic acid methyl ester; linolenic acid methyl ester, stearic acid methyl ester and linoleic acid methyl ester.

Procedures

Water content was determined by stove drying at 105°C until constant weight. Ashes were determined by muffle calcinations at 600°C until constant weight. Crude protein content was determined by the Kjeldahl method. (6.25 for the conversion of total nitrogen in proteins). [20]

Total Lipids were determined by acid hydrolysis, extraction and gravimetric analysis. [13]. Energetic value was calculated on the basis of protein and lipid amounts, using specific factors advised by FAO (4 kcal/ g for proteins and 9 kcal/ g for lipids). Conversion factor 4.186 kJ/ kcal were used.

Sodium and potassium were determined, in dry way mineralized samples, by flame photometry, using standard addition method [20].

Fatty acids profile was determined by gas chromatography of methyl esters. A Shimadzu GC-14B gas chromatograph with FID detector was used. Fatty acids were esterified boiling the sample to reflux with a mixture of methanol: benzene: sulfuric acid (20:10:1 v/v), subsequently petroleum ether (bp.40-60 $^{\circ}\text{C}$) extraction and evaporation of the solvent were performed until final volume of 1 mL was reached. This lipid fraction was then injected in chromatograph.

Chromatographic Analysis Conditions were: Carrier gas: N₂. Injection: 3 µL; injector temperature: 250°C. Column: DBWAX Mega Bore (30 m, internal diameter 0.53 mm). Temperature programming: a) 150°C, 1 min; b) 5°C/min to 230°C; c) 230°C, 5 min. Detector temperature: 280°C

Results

Obtained values with their standard deviation [21] are shown in tables 1 to 4. All percentages are in reference to wet weight. Six samples of each species were studied. The average of the determinations is showed. No significant differences were observed between specimens of the same specie.

Table 1: Macronutrients Composition (g/ 100 g) and Energetic Value (kJ/ 100 g) in dove breast.

Specie	% Water	% Ashes	% Proteins	% Lipids	Energetic value
<i>Zenaida auriculata</i>	71.97 ± 0.80	1.48 ± 0.05	18.98 ± 1.77	0.90 ± 0.07	352
<i>Columba picazuro</i>	73.43 ± 0.43	1.37 ± 0.03	20.78 ± 0.92	0.72 ± 0.12	375
<i>Leptotila verreauxi</i>	72.08 ± 0.74	1.37 ± 0.07	18.63 ± 1.10	1.24 ± 0.08	359

Table 2: Fatty Acids and Cholesterol percentage in dove breast. (g/ 100g lipid fraction).

Fatty Acid	Family	Z a	C p	L v
C (16:0)	Saturated	13.21± 0.35	13.53 ± 0.28	10.89 ± 0.52
C (18:0)	Saturated	27.65 ± 0.56	25.04 ± 0.45	22.90 ± 0.33
C (16:1)	n-7	-----	2.68 ± 0.06	-----
C (18:1)	n-9	10.34 ± 0.47	14.03 ± 0.50	2.16 ± 0.03
C (18:2)	n-6	36.23 ± 1.12	24.76 ± 0.72	36.84 ± 1.27
C (18:3)	n-3	-----	-----	14.90 ± 0.61
C (20:3)	n-9	-----	1.02 ± 0.03	-----
C (20:4)	n-6	9.51 ± 0.42	12.26 ± 0.41	8.13 ± 0.37
C (20:5)	n-3	-----	1.69 ± 0.05	1.00 ± 0.02
C (22:6)	n-3	2.02 ± 0.05	2.23 ± 0.04	1.74 ± 0.03
C (24:6)	n-6	1.04 ± 0.02	-----	1.43 ± 0.03
Cholesterol	Sterols	0.08 ± 0.002	0.05 ± 0.001	0.12 ± 0.004

Table 3: Total Content of Different Fatty Acid Families (g/ 100g lipid fraction).

Fatty Acid Family	Z a	C p	L v
Saturated (S)	40.86 ± 0.91	38.57 ± 0.73	33.79 ± 0.85
Monounsaturated (M)	10.34 ± 0.47	16.71 ± 0.56	2.16 ± 0.03
Polyunsaturated(P)	48.80 ± 1.61	41.96 ± 1.25	64.04 ± 2.33
S: M: P	1:0,25:1.20	1:0.52:1.10	1:0.06:1.90
n-3	2.02 ± 0.05	3.92 ± 0.09	17.64 ± 0.66
n-6	46.78 ± 1.18	37.02 ± 1.13	46.40 ± 1.67

Table 4: Sodium and Potassium content (mg/ 100g of breast).

Specie	Sodium	Potassium
Z a	20.6 ± 0.020	23.9 ± 0.006
C p	17.2 ± 0.044	21.3 ± 0.013
L v	14.8 ± 0.016	16.8 ± 0.011

Conclusions

From the analysis of the results obtained for dove's breast of Chaco province, we concluded that the three studied species make a similar contribution of macronutrients. The total fat content is inferior to 2%, so they can be classified as lean meats. Protein contribution of these meats is of the same order of the chicken breast and some bovine meat cuts [22], widely consumed in our country.

The contribution of polyunsaturated fatty acids to the diet from these meats is very important and overcomes saturated fatty acids of the same source. A high percentage of present fatty acids (37-46%) correspond to the n- 6 family.

The contribution of essential fatty acids is above 20% of the lipid fraction for linoleic (18:2 n-6) fatty acid for the three species. Contribution of linolenic fatty acid (18:3; n-3) is 15% for *Leptotila verreauxi*. Contribution of arachidonic acid (20:4 n-6), semiessential, is 8 to 12% of the lipid fraction. The content of n-6 fatty acids was found to be 37 to 47 % of lipids in the three species; however n-3 fatty acids are present in a low percentage (2-3,9 %) in *Zenaida auriculata* and in *Columba picazuro*, and 17 % in *Leptotila verreauxi*.

The low cholesterol content completes a fatty profile of very high nutritional quality.

Sodium content is less than 35mg/portion; which includes these meats among “very low sodium” foods, making them appropriate for hypertension diets.

Finally, the consumption of a portion of 100g covers the daily requirements of proteins for toddlers.

According to our results, doves breast of *Zenaida auriculata*; *Columba picazuro* and *Leptotila verreauxi*, exhibit good nutritional value and could be included among food of regional origin, and its consumption advised by FAO and WHO.

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