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Chemical composition of Creole beef cattle meat

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RESEARCH

SUMMARY. THE PROXIMAL COMPOSITION OF CREOLE CATTLE MEAT (CGBC) WAS DETERMINED. FOR THIS PURPOSE, THE FOLLOWING RAW CUTS WERE ANALYZED IN CGBC: BUTTOCK, CUT LOCATED IN THE FEMORAL REGION; ROUND, CUT LOCATED IN THE ABDOMINAL REGION; STRIPLOIN, CUT LOCATED IN THE DORSAL REGION; AND SHOULDER, CUT LOCATED IN THE ANGLE FORMED BETWEEN THE CAUDAL EDGES OF THE HUMERUS AND THE SCAPULA; THE CUTS MENTIONED CORRESPOND TO THOSE GIVEN BY THE NATIONAL MEAT BOARD OF THE ARGENTINE REPUBLIC. THESE

WERE TAKEN FROM AN EXPERIMENTAL BATCH OF CRIOLLO CATTLE (N = 11) FROM THE PROVINCE OF JUJUY. COMPARISONS WERE MADE WITH DATA EXTRACTED FROM THE ARGENTINE TABLE PUBLISHED BY THE NATIONAL INSTITUTE OF NUTRITION, BUENOS AIRES, ARGENTINA (1942), ON EXPORT-TYPE MEAT CUTS (CTE). FROM THESE COMPARISONS IT CAN BE INFERRED THAT THE PROTEIN LEVEL IS SLIGHTLY

LOWER THAN CTE (IN THE CASE OF CGBC IT VARIES BETWEEN 18.44±0.30 AND 21.06±0.11 G/100 G, WHILE IN CTE IT VARIES BETWEEN 20 AND 23.8 G/100 G). LIPID CONTENT IN CUTS WITHOUT VISIBLE FAT IS VARIABLE (1.06± 0.01 AND 2.74±0.61 G/ LOOG FOR CGBC CUTS AND 1.4 TO 8.4 G/LOOG FOR CTE CUTS). THE MINERAL CONTENT IS SIMILAR (FE IN GBC 2.26±0.18 AND 2.35±0.23 MG/100 G IN CGBC, WHILE IN CTE IT VARIES BETWEEN 3.15 AND 3.46 MG/100 G; P IN CGBC VARIES BETWEEN 142±10 AND 170±11 MG/LOOG WHILE IN CTE IT VARIES BETWEEN 186 AND 213 MG/LOOG). THESE

RESULTS ALLOW US TO AFFIRM THAT THE QUALITY OF CGBC IS VERY SIMILAR TO CTE IN TERMS OF ITS MAIN NUTRIENTS.

KEY WORDS: BEEF, CREOLE CATTLE, NUTRIENTS, PROXIMAL COMPOSITION.

INTRODUCTION

BEEF IS AN IMPORTANT SOURCE OF NUTRIENTS IN THE DIET OF THE ARGENTINE POPULATION, MAINLY

PROTEINS, MINERALS AND B VITAMINS. THE NATIONAL AVERAGE PER CAPITA CONSUMPTION IN 1996 WAS 59 KG/PERSON/YEAR (1).

THE NUMBER OF HEAD OF CATTLE IN NORTHWEST ARGENTINA REPRESENTS 3.2% OF THE COUNTRY'S TOTAL (2). THIS REGION COMPRISES THE PROVINCES OF JUJUY, SALTA, TUCUMÁN, CATAMARCA, LA RIOJA AND SANTIAGO DEL ESTERO. IN THE PROVINCE OF JUJUY, BEEF PRODUCTION IN 1983 AMOUNTED TO 80,000 HEADANDIN 1995REMAINED AT PRACTICALLYTHE SAME LEVEL (83,50 0 HEAD) (3). THESE FIGURES DO NOT COVER CONSUMPTION NEEDS, AND THE POPULATION PREFERS TO ACQUIRE

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SUMMARY. CHEMICAL COMPOSITION OF CREOLE CATTLE MEAT. PROXIMAL COMPOSITION WAS DETERMINED IN MEAT'S CREOLE CATTLE (CGBC). FOR THIS PURPOSE, FOUR RAW CUTS OF CGBC WERE ANALYZED; BUTTOCK, FLANK, LOIN BLADE STEAK, AND SHOULDER BLADE STEAK. THE MENTIONED NAMES OF THE MEAT CUTS COME FROM THE NATIONAL MEAT BUREAU FROM THE REPUBLIC OF ARGENTINA. THESE CUTS WERE TAKEN FROM AN EXPERIMENTAL LOT OF CREOLE CATTLE (N= 11) IN JUJUY PROVINCE. COMPARISONS WERE MADE WITH DATA EXTRACTED FROM ARGENTINE TABLE OF FOOD COMPOSITION, EDITED BY NATIONAL NUTRITION INSTITUTE, BUENOS AIRES, ARGENTINA (1942). THE RESULTS SHOW THAT THE LEVEL OF PROTEIN IS SLIGHTLY LOWER (IN THE CASE OF CGBC VARIES BETWEEN 18.44±0.30 AND 21.06±0.11 G/100 G, WHILE IN THE CTE VARIES BETWEEN 20 AND 23.8 G/100 G). THE CONTENT OF LIPIDS IN THE CUTS WITHOUT VISIBLE FAT IS VARIABLE (1.06±0.01 TO 2.74±0.61 G/LOOG IN THE CUTS OF CGBC AND 1.4 TO 8.4 FOR THE CUTS OF CTE). THE CONTENT OF MINERALS IS SIMILAR (FE 2.26±0.18 TO 2.35±0.23 MG/100 G IN CGBC, WHILE IN THE CTE VARIES BETWEEN 3.15 AND 3.46 MG/100 G; PHOSPHOROUS VARIES BETWEEN 142±10 AND 170±11 MG/100 G IN CGBC AND 186 TO 213 MG/100 G IN CTE). THESE OUTCOMES ALLOW TO AFFIRM THAT THE QUALITY OF CGBC BEEF IS VERY SIMILAR TO CTE BEEF WITH REGARD TO PRINCIPAL NUTRIENTS.

KEY WORDS: BOVINE MEAT, CREOLE CATTLE, NUTRIENTS, PROXIMAL COMPOSITION.

EXPORT-TYPE MEAT (CTE) FROM THE HUMID PAMPAS, ASSIGNING IT SUPERIOR QUALITIES.

THE PREVAILING CATTLE RAISING SYSTEM IN THE AREA IS THE PASTURE SYSTEM (4), WITH CREOLE BREED ANIMALS (A BREED THAT ORIGINATED DURING A FOUR-CENTURY ADAPTATION PROCESS), ZEBU AND

THEIR CROSSBREEDS, WHICH CAUSED PROBLEMS OF POOR ANIMAL FINISHING (APPEARANCE AND WEIGHT), AND THE CONSEQUENT DISCREDITING OF THE CREOLE BREED. HOWEVER, CONTRARY TO WIDESPREAD BELIEF, CRIOLLO CATTLE HAVE ADVANTAGEOUS CHARACTERISTICS, THANKS TO A PROCESS OF EVOLUTION THAT SPANNED FOUR CENTURIES AND GAVE RISE TO A POPULATION CHARACTERIZED BY ITS CLIMATIC AND GEOGRAPHIC ADAPTABILITY. ANOTHER OUTSTANDING QUALITY IS ITS GENTLENESS, WHICH FACILITATES ITS HANDLING IN EXTENSIVE CONDITIONS. IT HAS A HIGH DISPLACEMENT CAPACITY AND REQUIRES LESS WATER INTAKE, WHICH ALLOWS IT TO USE LARGE GRAZING AREAS. BASED ON ITS GENETIC AND BEHAVIORAL CHARACTERISTICS, IT CAN BE DEFINED AS A BREED (5, 6).

EXPORT-TYPE BEEF (CTE) IS PRODUCED ON A LARGE SCALE IN THE PAMPA HÚMEDA, A REGION COMPRISING THE PROVINCES OF BUENOS AIRES, CÓRDOBA, SANTA FE AND LA PAMPA. STATISTICS SHOW THAT IN 1995, PRODUCTION AMOUNTED TO 8,882.5 THOUSAND HEAD SLAUGHTERED (7).

THERE ARE CURRENTLY NO STUDIES AVAILABLE IN ARGENTINA ON THE CHEMICAL CHARACTERIZATION OF DIFFERENT CUTS OF CRIOLLO BEEF (CGBC), NOR ON THEIR BEHAVIOR WHEN SUBJECTED TO DIFFERENT TECHNOLOGICAL PROCESSES. THEREFORE, IN A FIRST STAGE, THE WORK WAS ORIENTED TOWARDS A SYSTEMATIC STUDY TO CHARACTERIZE THE CHEMICAL QUALITIES OF CGBC AND ITS COMPARISON WITH MORE WIDELY CONSUMED CTE MEATS.

THE PURPOSE OF THIS STUDY WAS TO COMPARE THE CENTESIMAL COMPOSITION OF DIFFERENT LOCALLY PRODUCED CGBC CUTS WITH THAT OF SIMILAR CTE CUTS FROM THE PAMPA HÚMEDA, A MAJOR NATIONAL PRODUCTION AREA.

MATERIALS AND METHODS

SAMPLING PLAN

IN VIEW OF THE NEED TO HAVE PERFECTLY DEFINED DATA CORRESPONDING TO AGE, SEX, LIVE AND SLAUGHTERED CATTLE WEIGHT, GENEALOGICAL RECORD, ETC., OF THE ANIMALS TO BE ANALYZED, THE COLLABORATION OF THE DEPARTMENT OF ANIMAL PRODUCTION OF THE FACULTY OF AGRICULTURAL SCIENCES OF THE NATIONAL UNIVERSITY OF JUJUY WAS SOUGHT, OF THE ANIMALS TO BE ANALYZED, WE SOUGHT THE COLLABORATION OF THE ANIMAL PRODUCTION DEPARTMENT OF THE FACULTY OF AGRICULTURAL SCIENCES OF THE NATIONAL UNIVERSITY OF JUJUY, WHO PROVIDED THE SAMPLES OF CRIOLLO AND CRIBÚ CATTLE (CROSSBREED OF CRIOLLO AND ZEBU), NECESSARY FOR THE ANALYSES AND THE REQUIRED DATA.

THE SELECTED BATCH OF ANIMALS CONSISTED OF THIRTY HEAD OF CRIOLLO STEERS AND THIRTY CRIBU

STEERS OF AN AVERAGE AGE OF TWO YEARS AND THREE MONTHS, THE AVERAGE WEIGHT OF THE CARCASSES WAS 354 KG, OF WHICH ELEVEN WERE SLAUGHTERED AT THAT TIME.

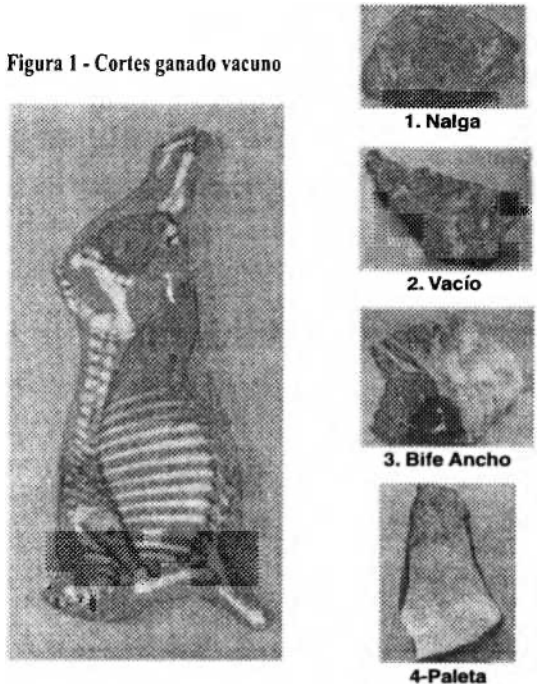
OF THE AVAILABLE SAMPLES, THREE WERE TAKEN AT RANDOM, TWO CRIOLLOS AND ONE CRIBÚ, WHOSE ANALYSIS WAS ALSO CARRIED OUT FOR COMPARATIVE

PURPOSES.

SAMPLING BEGAN AT THE SLAUGHTERHOUSE WITH THE MARKING OF THE CARCASSES.

AFTER TRANSPORTING THE MEATS TO THE COLD STORAGE CHAMBERS, WHERE THEY REMAINED FOR FIVE DAYS, THEY WERE DEPOSTULATED AND DELIVERED TO THE LABORATORY.

FOUR CUTS WERE SELECTED: BUTTOCK, CUT LOCATED IN THE FEMORAL REGION, IN THE INTERNAL FACE OF THE THIGH; VACUOLE, CUT LOCATED IN THE ABDOMINAL REGION, COMPOSED OF THE MUSCLES AND FASCIAE THAT COMPOSE THE ABDOMINAL WALL; BROADSTEAK, CUT LOCATED IN THE DORSAL REGION, COMPRISING THE 6, 7, 8 AND 9 THORACIC VERTEBRAE AND THE SPINAL END OF THE CORRESPONDING RIBS; AND SHOULDER, CUT LOCATED IN THE ANGLE FORMED BETWEEN THE CAUDAL EDGES OF THE HUMERUS AND SCAPULA, COMPOSED OF THE MUSCLES AND FASCIAE THAT COMPOSE THE ABDOMINAL WALL. THORACIC VERTEBRAE ANDTHE SPINAL END OF THE THE CORRESPONDING RIBS; AND SHOULDER, CUT LOCATED IN THE ANGLE FORMED BETWEEN THE CAUDAL EDGES OF THE HUMERUS AND THE SCAPULA, COMPOSED OF THE DISTAL MUSCLES OF THE SHOULDER BLADE (8) (FIGURE 1). THE SELECTION WAS BASED ON THE HIGH CONSUMPTION OF THESE PRODUCTS IN THE REGION.



SAMPLE PREPARATION

ONCE THE CGBC AND CRIBÚ ARRIVED AT THE LABORATORY, THE CUTS WERE DISSECTED TO SEPARATE THE VISIBLE FAT AND BONE IN ORDER TO CALCULATE THE PERCENTAGE OF VISIBLE FAT AND UTILIZABLE FRACTION (9). THE DEGREE OF FAT EXTRACTION WAS EXHAUSTIVE.

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THE CUTS WERE CUT AND SUBSEQUENTLY REDUCED IN A DOMESTIC PROCESSOR (MOULINEX PROCESSOR, 750 W), TAKING CARE TO INCORPORATE THE MEAT JUICE RESIDUES TO MINIMIZE LOSSES. IT WAS IMMEDIATELY WEIGHED FOR MOISTURE DETERMINATION. A PORTION OF THE FRESH SAMPLE WAS RESERVED FOR LIPID DETERMINATION. THESE SAMPLES WERE PLACED IN POLYETHYLENE BAGS, LABELED AND TAKEN TO THE FREEZER FOR FURTHER ANALYSIS.

MINERAL, PROTEIN AND ASH DETERMINATIONS WERE PERFORMED ON DRY SAMPLES.

DETERMINATION OF CENTESIMAL COMPOSITION

ALL SECTIONS WERE ANALYZED IN DUPLICATE. OFFICIAL AOAC (10) AND OTHER METHODS WERE USED FOR THE CENTESIMAL COMPOSITION ANALYSIS AS DETAILED BELOW:

Sample preparation (10.a), moisture determination (lo.b), using a vacuum oven (brand: Shell Lab, model 1410) at T= 80 °C and vacuum pressure of 96.5 mm Hg; determination of total nitrogen by the Kjedhal method and protein (lo.c), using a conversion factor of 6.25 characteristic for meats, determination of ash (lo.d) (muffle temperature550°C for 8 hours), determination of lipids (11), using as solvents a chloroform/methanol mixture according to the Bligh and Dyer technique, determination of phosphorus (12), by the colorimetric method at X = X= 0.25 for 8 hours), determination of phosphorus (12), by the Kjedhal method, using the Kjedhal method, by the Kjedhal method.The energy values were calculated using the factors of 4 kcal/g for proteins and 9 kcal/g for lipids (14). The kcal to kjoule conversion factor used is 4.186.

STATISTICAL ANALYSIS

The data were analyzed statistically by ANOVA, using a multivariate design. Individual effects and interactions between cuts and breeds were analyzed.

RESULTS AND DISCUSSION

The results obtained are expressed as mean ± standard deviation (SD).

Table 1 shows the average yields determined from the before and after slaughter weights of GBC and cribú. The values obtained represent normal performance indices.

Table 2 shows the values of usable fractions of CGBC and sieve cuttings.

Table 3 shows the results obtained for the proximal composition of the different raw cuts without visible fat, with their corresponding standard deviations.

TABLE 1

Creole and cribú cattle slaughter yields

Race	Yield (%) = (slaughtered weight/live
Cribú	57,2 ± 1,2
Creole	54,9 ± 1,7

TABLE 2

Usable fraction of beef cattle meat cuts criollo and cribú

Cut	Race					
	Creole			Cribú		
	Visible fat (%)	Bone (%)	Fraction Usable (%)	Visible fat (%)	Bone (%)	Usable fraction (%)
Buttock	4,9	—	95,1	8,1	—	91,9
Vacuum	23,7	—	76,3	20,8	—	79.1
Broad Beef	9,8	22,4	67,8	8,8	19,8	71,4
Palette	5,9	21,9	72,2	7,7	10,6	81,7

TABLE 3
Centesimal composition of raw beef cuts from Criollo cattle (CGBC), Cribú and export-type meat (CTE).

Race	Cut	Moisture (g/100g)	Protein (g/100g)	Lipids (g/100g)	Ash (g/100 g)	Energy Value (kcal/lOOg)	(kJ/IOOg)
Cribú	Buttock	74,42 ± 0,23a	19,51 ±0,01 a	2,07±0,34b	1,14 ± 0,02a	97	405
Creole	Buttock	74,44 ±0,16a	20.92 ± 0.78ab	1,06 ± 0,01a	1,09 ± 0,01a	93	388
CTE	Buttock	75,3a	21.2ab	1,4a	_	97	406
Cribú	Vacuum	75,29 ± 0.13a	18,42 ± 0,02a	2,17 ± 0,06b	1,06 ± 0,02a	92	387
Creole	Vacuum	75,32 ± 1,29a	20,38 ± 2,15a	2,51 ± 0,26b	1,03 ± 0,03a	101	424
CTE	Vacuum	66,5b	23,8b	8,4d	_	171	• 715
Cribú	Tenderloin	71,59 ± 0,45a	20,69 ± 0,03a	2,20 ± 0,05b	1,18 ± 0,01a	102	426
Creole	Tenderloin	72,16 ± 0,40a	21.06 ±0.1 lab-	2,52 ± 0,50b	1,07 ± 0,03a	109	458
CTE	Tenderloin	71,6a	20a	4c	_	116	486
Cribú	Palette	76,42 ± 0,40a	18,99 ± 0,27a	3.38 ± 0.06bc	1,02 ± 0,01a	106	442
Creole	Palette	75,80 ± 0,25a	18,44 ± 0,30a	2,74 ± 0,61b	1,02 ± 0,02a	98	412
CTE	Palette	72a	2 lab	1,4a	—	138	578

Values followed by equal letters do not show significant differences between them (a = 0.05). [T]

From the analysis of the results, it can be deduced that in the case of CGBC, the percentage difference in moisture content is 4.82% between the two extreme values 75.80±0.25 in the shoulder cut and 72.16±0.40 in the broad steak cut. In terms of protein content, the difference is of the order of 12.44%, the extreme values being 21.06±0.11 in the wide steak cut and 18.44±0.30 in the shoulder cut. On the other hand, the lipid content is highly variable according to the cut considered, the extreme difference being of the order of 61% between the cuts of rump (1.06±0.01) and shoulder (2.74±0.61).

Comparisons were made between CGBC and CTE cuttings. For the buttock cut, the differences found between the moisture contents of CGBC and CTE are not significant (P< 0.05), while the protein content is very similar. Lipid contents show greater differences, being 32% higher in the case of the CTE buttock cut.

For the vacuum cut, there are significant differences (P<0.05) in moisture, protein and lipid content, the former being higher by 11.7% and the latter two lower by 16.7% and 234% respectively for CGBC.

In the case of the broad beef cut, there are only significant differences (P<0.05) in the lipid content, 58.7% higher for CTE meat compared to CGBC meat. This value (4 g/loog) is higher than that cited by other authors in other regions of Latin America for the cut of beef in crossbred animals (2.90±1.04 g/100g)(15).

In the shoulder cut, there are significant differences (P<0.05) in protein content, 13.8% higher for CTE meat and 48.9% higher for CGBC meat.

Ash contents are very similar in all cases, with no significant differences.

Table 4 shows the results obtained in the determination of minerals (phosphorus, iron, calcium, magnesium and zinc) in raw samples. No data are available for the CTE shoulder cut in the Table published by the National Institute of Nutrition.

TABLE 4
Mineral content in raw beef cuts from Criollo cattle (CGBC), cribú and export beef (CTE).

		Mg/100 g				
Race	Cut	Faith	Ca	P	Mg	Zn
Cribú	Buttock	2,55 ± 0,07a	2,49 ± 1,01a	186 ± 5b	20,15 ± 2,61a	3.91 ± 2,87a
Creole	Buttock	2,26 ±0,18a	7,80 ± 8,34c	170 ± 1 Ib	22.04 ± 3.09ab	4.05 ± 2.l3ab
CTE	Buttock	3,46a	3a	186b	—	—
Cribú	Vacuum	2,85 ± 0.38a	2,98 ± 1,08a	216 ± 11c	25,38 ± 3,78b	4.96 ± 1.87ab
Creole	Vacuum	2.33 ±0.3la	6,85 ± 6,54c	142 ± 10a	21,09 ± 2,94a	6,15 ± 3,04c
CTE	Vacuum	3,15a	2a	213c	—	—
Cribú	Tenderloi	2,02±0,03a	9.77±0.47cd	213± 10c	25,11 ±4,07b	5.85 ± 2.45bc
Creole	Tenderloi	2,31 ± 0,40a	11,16 ± 4,33d	169 ± 8a	26.35 ± 3,56b	4.97 ± 2.98ab
CTE	Tenderloi	3,18a	2a	188b	—	—
Cribú	Palette	2,34 ± 0,06a	4.59 ± 0.15bc	204 ± 7c	27,12 ± 4,16b	7,16 ± 3,67c
Creole	Palette	2.35 ± 0,23a	9.39 ± 8.15cd	146 ± 3a	24.17 ± 3.88ab	6,63 ± 3,01c

Values followed by equal letters do not show significant differences between them (ct= 0.05).

Statistical analysis reveals that there are no significant differences both between cuts and breeds, with a probability of 95%, for iron content. There are significant differences in Ca content both between cuts and breeds, being higher in the case of the CGBC buttock cut compared to the CTE buttock cut by 67.7%. In the vacuum cutoff it is 242% higher for the CGBC cutoff. Zn and Mg contents are slightly higher in the CTE. P content showed significant differences ($P<0.05$) between breeds and between cuts.

CONCLUSIONS

Comparing the values of moisture, protein and lipid levels found for Criollo cattle meat and those reported by the National Institute of Nutrition in Argentina corresponding to export-type meat, it can be concluded that the meat of animals from the northwest of Argentina has a composition similar to that of the usual consumption, coming from the Humid Pampa, where climate, geography and management techniques are completely different. It can be concluded that the meat of animals from the northwest of Argentina has a similar composition to that of normal consumption, coming from the Humid Pampa, where the climate, geography and management techniques are completely different.

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