



Contents lists available at ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Salted goat and lamb meat: Typical regional product of the city of Petrolina, state of Pernambuco

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ARTICLE INFO

Article history:

Available online 1 April 2011

Keywords:

Market
Meat quality
Processing
Productive chain
Yielding

ABSTRACT

The purpose of this research was to obtain information and establish identity patterns and product quality, consequently, contributing to the strengthening of goat and sheep production in the semi arid region of Brazil. The study was performed in three restaurants which are part of the gastronomic complex called “Bodódromo”, located in the city of Petrolina, in the state of Pernambuco, Brazil. The yielding of salted meat after deboning varied from 71.2 to 75.3%, and the yielding of the salted meat for charcoal grilling was from 63.3 to 72.6%, and produced values between 6.9 and 10.6 kg of salted meat for charcoal grilling consumption from the carcasses that weighed between 16.3 and 21.2 kg. Heavier carcasses yielded more at deboning and for salted meat for charcoal grilling in the restaurants. The average nutritional values found in the salted meat characterized it as being a food of high moisture (71.56 ± 0.089), high protein (21.55 ± 0.710) and low lipid content (1.95 ± 0.239). The results obtained indicate a viability of salted goat and lamb meat production, both in the commercial aspect and in the characteristics of its nutritional composition. There is a need for improvements in the productive chain, such as a definition of a “pattern animal”, or a better carcass weight, for the preparation of the product.

Published by Elsevier B.V.

1. Introduction

The growth of goat and lamb meat consumption in some regions of Brazil has increased the internal market demand as well as the product value, and promoted the expansion of goat and sheep production in the country (Pinheiro et al., 2008). This has been happening in the northeastern part of that country, along with consumer requirements for better quality meat.

It is a fact that in some urban centers the consumption of goat and lamb meat has occurred in social classes with enough purchasing power to buy dishes that cost more than 20% over the value of the carcass that originated this del-

icacy. This means that goat and lamb meat is not just a source of protein for the poor population of the semi arid region. This is due to the ample divulgation of the sensorial and nutritional qualities of this meat, which promoted considerable increase in consumption in non-traditional regions (Couto, 2003). Goat and lamb meat is the most expensive meat in developed countries. Consumption is dependent on cultural factors and will be increasing as populations and incomes grow (Boutonnet, 1999; Juma et al., 2010). Sun-dried beef (carne de sol), jerked beef, and salted goat and lamb meat have become the most important dehydrated meats by means of salting and drying method in the Brazilian northeast.

Popularly known in the sub-middle region of the São Francisco River as cut and salted meat, salted goat and lamb meat is a traditional product commercialized in the open markets and butchers for domestic consumption, and in the restaurants of the region, such as establishments which are

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a part of the gastronomical complex known as the “Bodódromo” in the city of Petrolina, in the state of Pernambuco, in Brazil.

Salted goat and lamb meat is a product coming from the partial deboning of goat and lamb carcasses and posterior cutting. Later it is salted and dried. This cutting consists in penetrating cuts made in the muscular parts of the carcass with variable distances, and depths of one or two centimeters according to the thickness of the meat. After cutting, the meat is salted with common refined salt and hung on lines inside screened booths known as “greenhouses” for drying. The cutting process aggregates value to the goat and lamb meat because the carcass is deboned and cleaned, generating a “boneless meat” product. In this case, the yield of the edible portion of the goat and lamb meat (deboned meat) is the relation between the weight of the salted meat and the weight of the cold carcass.

This research had the objective of divulging dressing yield and chemical composition data about salted goat and lamb meat produced in Petrolina, Pernambuco.

2. Material and methods

The experiment was conducted in three restaurants which are part of the “Bodódromo” gastronomical complex in the city of Petrolina, Pernambuco. For the choice of these establishments called A, B and C, a questionnaire with semi-structured questions was applied, and the main criteria for this choice were: volume of production and commercialization of salted goat and lamb meat per month, hygiene and sanitary aspects of the processing place, and agreement to participate in the research.

To perform this study on the dressing yield, the process of production of 80 salted goat and lamb meat cuts was followed, according to the daily production of each establishment. The carcasses bought by the restaurants for the production of the salted meat came from animals from producer associations located in the cities of Dormentes and Afrânio – in the state of Pernambuco, Brazil.

The animals slaughtering was performed in the municipal slaughterhouse in Petrolina, under the State Service Inspection (Serviço de Inspeção Estadual – SIE). The delivery of the carcasses to the restaurants was performed 12 h after slaughter. Most of the carcasses used as raw material in restaurants A and B were from castrated male animals (33 males and 7 females for restaurant A and 16 males and 4 females for restaurant B), while in restaurant C, the predominance was of females (15 females and 5 males).

To obtain the dressing yield, the cold carcasses were weighed before the intervention of the meat cutter. The dressing yield of salted goat and lamb meat cuts were obtained by restaurant and age of animals.

Right after that, the carcasses were partially deboned (first deboning), when practically all the bones were removed, except the shoulder and ribs. A cleaning was also performed to remove the excess fat, lymph nodes, and other non-edible tissue. The yield before salting was determined by the relation between the weight of the salted meat after deboning and the weight of the carcass received by the restaurant. All of the bones from the first deboning

along with the trimmed leftovers were weighed, and this constituted the deboning loss. After salting, the meat cuts were put in drying ovens, according to the procedures of each restaurant, and later removed and weighed. The salting used an average of 250 g of salt (sodium chloride)/salted meat cut. The weight obtained after drying was called post-drying salted meat cut.

After the complete deboning, salting and drying process, the bones remaining from the first deboning (shoulder and ribs bones) and the corresponding part of the flank or empty carcass (primary and secondary muscles and visible fat deposits on the surface of these muscles) were removed. For the determination of the chemical composition, samples of the salted meat were collected from the three restaurants in question. The samples were identified and transported in isothermal boxes with ice to the Laboratory of Chemical Analysis of Foods belonging to the Federal University of the State of Paraíba (UFPB). There, the samples were stored in a freezer, for a period no longer than 60 days, until the moment of analysis. Before analysis, the samples were defrosted under refrigeration for 12 h, and then ground in a multiprocessor until complete homogenization of the material. This material was analyzed for moisture, ash and protein according to analytical standards of the AOAC (2000), procedures *n*-39.1.03, *n*-39.1.09 and *n*-39.1.15 respectively; lipids were measured according to the methodology of Folch et al. (1957).

All of the analyses were performed in triplicates. The results are presented in the form of descriptive statistics which were obtained with the aid of Statistical Analysis System – SAS (2003).

3. Results and discussion

The weights of the carcasses used in the restaurants of the Bodódromo complex varied according to the preference of the establishment, as is shown in Table 1.

Restaurant A utilized carcasses with average weights of 16.3 varying from 11 to 22 kg. Restaurants B and C preferred heavier carcasses, which reached average weights of 20.5 and 21.2 kg, respectively. Usually, these carcasses came from adult animals, mainly from females. The losses from the partial deboning (in which all bones, except the shoulder and ribs were removed) varied from 4.7 to 5.2 kg among the restaurants, and the restaurant (A) which utilized lighter-weight carcasses had lower losses in absolute values. However, in percentage terms, the losses related to the first deboning and cleaning were considerable, representing around 28.5, 25.4, and 24.5%, for restaurants A, B, and C, respectively. Immediately after the first deboning, the salted meat cuts reached weights between 11.6 and 16.0 kg, and their dressing yields varied in averages ranging from 71.2 to 75.3%.

In Table 1, maximum values of 75.8, 77.6 and 84.8%, and minimum values of 62.3, 70.2 and 68.5% of dressing yield were obtained in the partial deboning among the three restaurants. The percentages obtained by restaurants B and C are reflexes of the preference for heavier carcasses coming from adult animals, such as the females, which usually have a higher deposition of muscular and adipose tissue (Purchas et al., 2002). Despite greater dressing yields being

Table 1

Weights and salted and lamb meat dressing yields obtained in restaurants in the city of Petrolina, state of Pernambuco.

Variables	Restaurant A (n = 40) ^a			Restaurant B (n = 20)			Restaurant C (n = 20)		
	Average ± sd	max	min	Average ± sd	max	min	Average ± sd	max	min
Cold carcass, kg	16.3 ± 2.6	22.0	11.0	20.5 ± 1.6	22.5	18.5	21.2 ± 2.7	29.0	18.0
Bones, kg	3.97 ± 0.5	4.9	3.10	3.9 ± 0.3	4.5	3.4	3.2 ± 0.4	4.2	2.4
Leftovers, kg	0.69 ± 0.3	1.6	0.34	1.3 ± 0.4	2.5	0.9	2.0 ± 0.8	4.0	0.8
Meat cut without salt, kg	11.6 ± 2.0	15.5	6.86	15.3 ± 1.1	17.5	13.7	16.0 ± 2.2	20.8	12.3
Loss in deboning, %	28.8 ± 2.16	37.6	24.4	25.6 ± 1.5	29.8	22.4	24.71 ± 3.6	31.5	15.2
Post-deboning dressing yield, %	71.2 ± 2.16	75.8	62.3	74.3 ± 1.5	77.6	70.1	75.3 ± 3.6	84.8	68.5
Post-drying dressing yield, kg	10.9 ± 1.8	14.9	6.4	13.3 ± 0.8	14.9	12.1	14.66 ± 2.0	19.4	12.1
Bones ^b of the meat cut, kg	3.9 ± 0.6	5.4	3.0	4.6 ± 0.8	6.7	3.3	4.0 ± 1.0	5.7	2.5
Meat cut for skewer, kg	6.9 ± 1.5	10.2	3.0	8.7 ± 0.7	9.9	7.6	10.6 ± 1.3	15.2	9.0
Dressing yield for skewer, %	62.9 ± 5.5	71.2	47.1	65.7 ± 4.8	74.8	54.6	72.7 ± 4.5	80.4	66.4
Dressing yield in relation to cold carcass, %	42.3 ± 4.3	50.6	27.4	42.7 ± 3.0	47.0	35.8	50.4 ± 4.7	58.9	39.3

^a Number of animals.^b Shoulder and ribs.

promoted by heavier carcasses largely coming from adult animals, this is not a guarantee that the meat will have better organoleptic characteristics in relation to the meat of younger animals.

Madruca (2005) reported that lamb meat is preferred among consumers all over the world for being more tender, juicier, and for having less intense flavor and odor. In the case of the salted goat and sheep meat in the “Bodódromo” complex, because it is a typical and traditional delicacy, consumers do not demonstrate any rejection to this product (salted goat and sheep meat), even when coming from older animals (data unpublished). This salted goat and sheep meat is very appreciated for its characteristic flavour and high nutritional value.

The weights of the meat cuts after salting and drying reached values of 10.9, 13.3 and 14.6 kg (Table 1). Calculating the difference between the weights of the cuts before and after drying, the obtained values were 0.68, 1.9 and 1.4 kg of losses during the process of drying. These losses are represented by partial dehydration of the meat by the salt, as well as factors associated to lack of standardization in terms of timing and localization of the drying ovens for the process of drying the salted goat and lamb meat. An example of this is that restaurant A performed the drying of their meat cuts for a shorter period of time and in the shade (2–3 h) and restaurants B and C used drying periods of 2–5 h in the shade and in the sun.

The commercialization of the salted goat and lamb meat cuts in the restaurants is performed from fractioned portions of the salted meat (muscle and adipose tissue) with which the skewers are made. The quantities of salted meat for the skewers were 6.9, 8.7; and 10.6 kg, representing about 62.9, 65.7 and 72.7% of the dressing yield at the three respective establishments studied, and restaurant C can be pointed out for using heavier carcasses.

Regarding the age of animals, the restaurants that used lighter carcasses, used ones that came from goats and lambs with an average of 8–12 months of age, while the restaurants that made the salted goat and lamb meat cuts with heavier carcasses, used carcasses from animals varying from 24 to 36 months, mainly from adult female goats and lambs, which was the case of restaurant C, where the heaviest carcasses registered 25.0 kg. The carcasses

originating from animals with ages between 8–12, 13–24 and 25–26 months, weighed an average of 16.8, 21.2 and 20.6 kg, respectively (Table 2).

The percentages of losses with deboning were lower for those carcasses from older animals (from 24 to 36 months of age) and represented respectively, 25.6 and 24.6%. The dressing yield, after partial deboning, of the cuts of the adult animal carcasses (13–24 and 25–36 months) were similar, with values of 74.8 and 75.4%, while these yields of the salted meat coming from younger animal carcasses reached an average of 71.5%. The weights of the salted meat cuts for skewers, measured after the second deboning when the shoulder and ribs were removed, were 7.2, 9.3 and 10.4 kg. These results reflected directly on the yields of the skewers, which were of 63.3, 67.0, 72.3% for the salted meat cuts produced with the carcasses of animals of 8–12, 13–24 and 25–36 months, respectively. These values are attributed to larger quantities of muscle and adipose tissue present in carcasses of older animals, represented largely by carcasses originating from ewes.

Cezar and Souza (2007) reported that no matter the species or the sex, but as the age or maturity of the slaughtered animal increases, there is an increase in the dressing yield of the carcasses, although the quality of these carcasses, mainly tenderness, tends to diminish. This was also confirmed by Purchas et al. (2002), when studying the goat and lamb meat of animals slaughtered at 2 and 3 years of age.

Salted goat and lamb meat can be rated as having high nutritional value, and presenting high protein content (21.5%), and low fat content, as can be observed in the results presented in Table 3, which confirm this meat's importance as a source of animal protein for the consumer. It is important to highlight that the salted goat and lamb meat presents a chemical composition which is similar to the “carne de sol”, but very distinguished from the charqui and jerked beef salted meat products (Shimokomaki et al., 2003).

The high contents of moisture and protein found in salted goat and lamb meat make it a perishable product, thus it is necessary to use other conservation methods besides the salt it contains. It is necessary to be refrigerated, and the evaluated restaurants already used this method.

Table 2

Weights and dressing yield of salted goat and lamb meat cuts per age of the animals.

Variables	Up to 12 months (n = 46) ^a			Up to 24 months (n = 17)			Up to 36 months (n = 17)		
	Average ± sd	max	min	Average ± sd	Max	min	Average ± sd	max	min
Cold carcass, kg	16.8 ± 2.8	22.0	11.0	21.2 ± 2.4	29.0	18.5	20.66 ± 3.0	25.0	18.0
Bones, kg	3.9 ± 0.5	4.9	3.10	3.8 ± 0.5	4.5	2.9	3.2 ± 0.3	3.7	2.4
Leftovers, kg	0.8 ± 0.4	2.9	0.3	1.5 ± 0.7	4.0	1.0	1.9 ± 0.6	2.75	0.8
Cut without salt, kg	12.1 ± 2.2	16.4	6.8	15.8 ± 1.8	20.8	13.7	15.54 ± 1.9	19.5	12.3
Loss with deboning, %	28.4 ± 2.2	37.6	24.4	25.6 ± 1.9	28.4	20.2	24.9 ± 3.8	31.5	15.7
Post-deboning dressing, Yield, %	71.5 ± 2.2	75.6	62.4	74.8 ± 1.9	79.8	71.5	75.1 ± 3.7	84.8	68.5
Cut after drying, kg	11.3 ± 1.9	16.0	6.4	13.9 ± 1.2	17.1	12.1	14.21 ± 1.96	19.4	12.1
Bones ^b of the cut, kg	4.0 ± 0.6	5.4	3.0	4.6 ± 0.8	6.7	3.3	3.89 ± 0.9	5.2	2.5
Cut for skewer, kg	7.2 ± 1.6	11.5	3.0	9.3 ± 0.9	11.4	7.6	10.3 ± 1.64	15.2	8.0
Dressing yield for skewer, %	63.3 ± 5.6	74.2	47.1	67.0 ± 4.6	74.8	54.6	72.64 ± 5.3	80.5	63.0
Yield of the salted cut in relation to the cold carcass, %	42.4 ± 4.3	51.1	27.6	44.3 ± 3.2	49.1	35.8	50.0 ± 5.9	59.8	38.1

^a Number of animals.^b Shoulder and ribs.**Table 3**

Chemical composition (average ± standard deviation) of the salted goat and lamb meat in the region of the Valley Sub-médio of the São Francisco River Valley.

Product	Moisture	Ashes	Protein	Lipids
Salted Goat and Lamb Meat (g/100 g)	71.56 ± 0.09	2.72 ± 0.02	21.55 ± 0.71	1.95 ± 0.24

About 50% of the minerals found (2.72%) in this meat are in the form of chlorides. This fact is directly associated to the usage of salt, an essential ingredient in the preparation of the product.

4. Conclusion

The results obtained indicate a viability of production of salted goat and lamb meat. Heavier carcasses had a higher dressing yield in the deboning for skewers in restaurants. The need for improvement in the productive chain of this meat could also be observed, mainly regarding the producers definition of a “standard animal”, or the best carcass weight for the production of this product.

Conflict of interest

None declared.

Acknowledgement

We thank the ETENE/FUNDECI of Bank of Northeastern Brazil (BNB) for providing financial support.

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