

DRY CURED SHEEP MEAT “CECINA” ACCEPTABILITY FROM DIFFERENT CULTURAL BACKGROUND CONSUMERS

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Abstract – In many countries fresh meat from cull ewes has a low price and low consideration by the consumers. Nevertheless, in Spain other meat products, such as dried and cured meat named ‘cecina’, has comparatively high prices. On the other hand, due to people migrations, there is a large variability in the origin of the populations. To know the acceptability of ‘cecina’ by consumers from Europe (native Spanish), Asia (Chinese), Africa (Sub-Saharan) and America (Andeans), 320 consumers tasted under standardized conditions ‘cecina’ from 48 legs of culled ewes from 3 different body condition scores (BCS). Globally the product was well accepted by the four groups of consumers, being the Africans the population that gave the highest scores ($p < 0.01$). Only for the Spanish consumers, statistical differences between the acceptability of the three BCS were found. They preferred the leaner animals. The possibility of producing ‘cecina’ on larger scale would favor breeders who could profit from selling transformed and high price meat.

Key Words – Body condition score, Cull ewes, Ewe ham

I. INTRODUCTION

Following the FAO information, by the year 2050, one of the human challenges is to increase production to feed the world increasing also the farmer’s income. After the reduction in global supplies of sheep worldwide during the last decades, Rowe [1] highlighted that sheep meat market share will be recovered associated with price incentives in comparison with other meats. In small ruminants one of the alternatives to those aims could be to add value, in quantity, quality and price, to the meat from cull females, ewes and goats. To achieve this goal, it would be important to send animals to the market with an optimal

finishing grade (adequate body condition) and transform the fresh meat into meat products with higher value, such as ‘cecina’.

‘Cecina’ is an intermediate moisture food prepared by salting, drying and, occasionally, smoking meat pieces. The stability and long shelf-life of these products are due to their low water activity [2]. ‘Cecina’ is a traditional product, appreciated in some areas of the Mediterranean region. Among ‘cecinas’, those from beef hind leg are the best well known for its quality characteristics; rich flavor, soft texture and appealing color, but the product is also prepared from sheep, goat, horse, wild pig or wild ruminants. After many years of decline, its production is increasing steadily. But its acceptability by a majority of the population is questioned and unknown.

The world population is increasing and their movements between countries are also a perspective for the future. Those immigrants can, have access to high relatively price products, because their income could be comparable to the native, Sheep meat cannot compete with poultry or pig meat in volume or price, therefore, the alternative way is to focus more on differentiation based on quality and consistency [1].

Meat acceptability is dependent on the consumer cultural background or consumption habits [3, 4, 5, 6]. But up to date, information about ‘cecina’ or any other traditional product tasted by very different populations does not exist. This was the aim of the current work.

II. MATERIALS AND METHODS

Twenty four cull ewes from Rasa Aragonesa breed, were selected at random between the animals prepared to be slaughtered in a large cooperative (Pastores Group), to be representative of 3 different body condition scores [7]: fat, medium and lean. The fat contents of these 3 groups, by complete dissection of the left shoulder, were respectively: 8.8%, 15.9% and 22.9%. Their intramuscular fat contents, (*Longissimus dorsi*) determined by the ISO R-1443, were: 3.9%, 5.7% and 8.5%, respectively.

Animals were slaughtered following the halal procedure in a licensed abattoir, in Barbastro (Huesca, Spain). Carcasses were refrigerated at 4°C and sent by a refrigerated van to the Zaragoza University facilities, where the two forelimbs of the animals were excised, kept at vacuum and sent, with 4 days of ageing, to the industry where they were processed (Secadero Sierra Maestrazgo, Castellote, 760 meters high, Teruel).

Whole hind legs ($2.9 \pm 0.4\text{kg}$) were fat trimmed if required, and then a massage was given in order to eliminate any rests of blood, particularly within the femoral blood vessels. The surface of meat pieces was rubbed with marine salt. Pieces were then placed above a salt layer, directly on the floor, and covered by another salt layer. Several layers of meat pieces and salt were piled up one above the other. This operation was carried out in a cold room at 0-4°C. Time needed for penetration of the convenient amount of salt was of about 0.3 days of salting per kg of meat. At the middle of the salting process the order of meat layers was inverted, that means that those which were in the top were moved to the bottom and piled up again inversely. Later, salt rests on the surface of meat pieces were eliminated by washing them with cold water, following by a new massage.

Legs were then hung in a cold room to allow a homogeneous distribution of salt within the meat mass. The cold room was kept at refrigeration temperatures, at 5°C, with the aim of inhibiting microbial growth, and 80% of humidity. The time needed for salt equilibration was between 45 and 50 days. During this time, drying of meat pieces

starts together with the diffusion of the salt to the internal areas of the leg.

The drying was brought about by hanging meat pieces in natural conditions, at winter time. Room temperature kept around 15°C and mid-high relative humidity (85-90%). The duration of the drying process was about 2 months. Each individual leg was observed and vacuum packaged when the technician of the industry took the decision. Throughout this drying process, a parallel ripening occurred. Biochemical reactions of ripening rise to flavour formation and textural changes, which result in sensory characteristics typical of 'cecina'.

Later, in a unique day, 'cecinas' were deboned and the main muscles (*semitendinosus*, *semimenbranosus*, *glutaeus biceps* and *adductor*) were kept together, vacuum packaged and maintained at 4°C until analysis.

Three hundred and twenty consumers were selected following sex and age distribution of the local or immigrant population (Zaragoza, DGA) from 4 different cultural backgrounds: Native Spanish, Chinese, Sub-Saharan and Andean people (Table 1). Consumers evaluated product acceptability of the three different body condition groups, under standardized situation tests (SST), supervised by a bilingual native, with the same enquires - double translated, to Spanish, French, English or Chinese, depending on the own consumer preference. Mineral water and dry bread, to clean the mouth at the beginning and between samples were provided.

Table 1 Consumer characterization (by sex and age) of the 4 cultural backgrounds (%)

| | | Spanish | Chinese | African Sub-Saharan ¹¹ | Andean ² |
|----------|-------|---------|---------|--------------------------------------|---------------------|
| <i>N</i> | | 80 | 80 | 80 | 80 |
| Sex | Men | 46.2 | 63.8 | 75.0 | 45.0 |
| | Women | 53.8 | 36.2 | 25.0 | 55.0 |
| Age | ≤25 | 20.0 | 27.9 | 12.7 | 18.8 |
| | 26-40 | 22.5 | 46.8 | 59.5 | 51.3 |
| | 41-54 | 28.8 | 21.5 | 22.8 | 25.0 |
| | ≥55 | 28.8 | 3.8 | 5.1 | 5.0 |

¹70% Senegal, 12.5% Gambia, 1.2% Mauritania, 3.8% Nigeria, 6.2% Equatorial Guinea, 6.2% Ghana; ²60.3% Peru, 28.2% Ecuador, 11.5% Bolivia.

Samples 1 to 2 mm thick (sliced with a continuous blade machine) for the 3 treatments were offered following an equilibrate design and the same animals were tasted by the same number of consumers inside each cultural group. A hedonic structured 9 point scale was used, where 9 was the highest acceptability score (I like extremely), and 1 the lowest (I dislike extremely).

We performed a variance analysis with SAS 9.1.3, considering the fixed effect of treatments - body condition levels - on the acceptability variables, and consumer as random effect.

III. RESULTS AND DISCUSSION

Globally the most accepted 'cecina' was that from the leanest animals (Table 2), although not significant differences were found in comparison with the other two groups. This was also observed in the Spanish and Andean consumers, been only significant in the Spanish case. This fact could be related to the accumulation of lipid-derived compounds in the fat, which could produce strong aromas detected and poorly accepted by that group of consumers. These results could derive from the size of the piece used for drying. The smallest legs were those from the leaner animals, and because of that, these leaner legs required a shorter drying period and consequently lower amino acid degradation.

The notes of acceptability were globally quite acceptable (6.69 in average over 9.0 points), been the Africans the group of consumers that gave the highest scores, statistically different from the other 3 groups. These results are related with the superior knowledge of the product for this group of consumers; the same has been previously demonstrated in goat and lamb meat [4, 8]. Thus, 45.0% of the consumers from Africa answered that they had tasted before this type of product (results not shown), by only 34.2% of the Andean, 23.8 % of Spanish and 14.3% of the Chinese consumers. They also showed (Table 3) superior ovine meat consumption. Besides, the Africans apparently accepted better (without significant differences) the meat from the fatter animals, with probably stronger flavor.

Table 2 Overall acceptability of 'cecina' from ewes of different body condition scores (BCS) by people from different cultural and culinary background

| BSC | Average | SP ¹ | CH ² | SS ³ | AN ⁴ |
|--------------|---------|-----------------|-----------------|-----------------|-----------------|
| N | 320 | 80 | 80 | 80 | 80 |
| Lean | 6.77 | 6.82a | 6.39 | 7.40 | 6.48 |
| Medium | 6.66 | 6.50ab | 6.40 | 7.49 | 6.26 |
| Fat | 6.65 | 6.00b | 6.46 | 7.80 | 6.33 |
| Significance | 0.664 | 0.002 | 0.960 | 0.336 | 0.651 |
| Average | | 6.44y | 6.42y | 7.56x | 6.35y |

¹Spanish, ²Chinese, ³African Sub-Saharan (70% Senegal, 12.5% Gambia, 1.2% Mauritania, 3.8% Nigeria, 6.2% Equatorial Guinea, 6.2% Ghana), ⁴Andean (60.3% Peru, 28.2% Ecuador, 11.5% Bolivia).

x, y: different letters means significant differences in the same row, p<0.01

a, b: different letters means significant differences in the same column, p<0.01.

Table 3 Consumers' ovine meat consumption (%) in their home country or in Spain

| | | never | 1m | 2/3m | 1w | 2/3w | >3w |
|-----------------|---------|-------|------|------|------|------|------|
| SP ¹ | Country | 6.3 | 23.8 | 32.5 | 31.3 | 6.3 | 0.0 |
| CH ² | Country | 46.8 | 34.2 | 8.9 | 5.1 | 3.8 | 1.3 |
| | Spain | 50.0 | 28.2 | 12.8 | 2.6 | 3.9 | 3.6 |
| SS ³ | Country | 13.8 | 17.5 | 23.8 | 11.3 | 25.0 | 8.8 |
| | Spain | 15.0 | 13.8 | 17.5 | 11.3 | 25.0 | 17.5 |
| AN ⁴ | Country | 44.7 | 23.7 | 13.2 | 9.2 | 4.0 | 5.3 |
| | Spain | 31.3 | 35.0 | 12.5 | 15.0 | 6.3 | 0.0 |

¹Spanish, ²Chinese, ³Africans Sub-Saharan (70.0% Senegal, 12.5% Gambia, 1.2% Mauritania, 3.8% Nigeria, 6.2% Equatorial Guinea, 6.2% Ghana), ⁴Andean (60.3% Peru, 28.2% Ecuador, 11.5% Bolivia).

m= month; w= week; 1= consumption of once a month (m) or a week (w), and so on.

IV. CONCLUSION

Globally the 'cecina' from cull ewes could have a good acceptability by the consumers, independently from their cultural background. In general the finishing level (fatness) of the animals was not a criterion to modify the acceptability, although some groups of consumers could prefer different fat levels. Given its good acceptability, and its economical advantages in comparison with

the fresh product, it is evident that the production of 'cecina' would have a positive economic income for breeders.

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