

COMPOSITION OF BEEF FROM THE MARKET PLACE AND ITS RELATION WITH CONSUMER EXPECTATIONS

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I. INTRODUCTION

The consumption of fresh beef has been negatively affected by several phenomena. At individual consumer level, the increasing concerns for healthy and safe food, as well as environmental and ethical issues are the main reasons for the decrease in beef consumption [1]. Despite that, sensory properties (appearance, texture, juiciness, flavour) still remain the main purchasing and repeated purchasing criteria. Beef products with Protected Denomination of Origin (PDO) label, are originated from local beef breeds raised in traditional production systems. The promotion of such products is of considerable benefit to the rural economy by improving incomes for farmers and retaining the rural population. Certified beef consumption has increased due to public perception of its higher nutritional value and safety. However, commercial crossbred cattle produced under intensive systems provide the main supply of beef at competitive prices. Brazilian beef industry has a high potential for exportation to several international markets, thus it is important to assess quality of Brazilian beef present in the market. For consumer differences in beef quality are not very clear and expectations concerning certified beef are very high. The aim of this study was to compare beef quality from the three main market segments, certified beef, regular beef and imported beef from Brazil, and relate it with consumer expectations.

II. MATERIALS AND METHODS

This study was performed on retail beef samples collected during 5 months in a supermarket chain in Lisbon, one sample per each batch marketed in the supermarket during the trial period. Collection of samples was made in order to mitigate consumer purchase. The PDO beef is obtained from Alentejana purebred young bulls produced in a traditional semi-extensive production system according to the product specifications. The regular beef is obtained from crossbred young bulls (mainly with Charolais and Limousin sires), in a conventional intensive concentrate-based system, being the most consumed beef type in Portugal, and sold without a specific brand. Brazilian beef is obtained from crosses of local breeds, like Nelore (*Bos indicus*), with more exotic breeds (*Bos taurus*), and is produced on grazing with a finishing period with compound feed. Samples of LL (around 0.7–1.0 kg) were collected from the strip loin, minced, vacuum packaged and frozen at -18 °C until analyses were performed. Two steaks were left intact for Warner Bratzler Shear Force (WBSF) determination and sensory panel evaluation. pH, colour parameters, dry matter, protein, intramuscular fat and pigment content, collagen concentration (% DM) and solubility (% total collagen), and myofibrillar fragmentation index (MFI) were determined as described by Monteiro et al [2]. Cooking losses (CL) were determined after steaks were weighted, grilled until 70 °C of internal temperature, and weighted again. Sample preparation for WBSF evaluation was made as described by Monteiro et al. [3]. Panellists assessed a profile composed by tenderness, juiciness, flavour, off-flavours and overall acceptability (OA). Consumer questionnaires (n=200) were performed at the purchasing moment in the hypermarket, with the same three beef types, and covered consumers' usage of quality cues and evaluation of beef quality in purchase environment. Statistical analysis was carried out using the GLM procedure of SAS by analysis of variance. Variables relationship was determined using the Pearson's correlation coefficients.

III. RESULTS AND DISCUSSION

Brazilian beef had higher ageing period than the other beef (78 days vs. 12 and 13 in PDO and regular beef, respectively). PDO beef presented lower pH than the other beef, and lower MFI than Brazilian beef. All beef types presented similar colour parameters values, collagen solubility and CL which were similar to those presented by Monteiro et al. [3]. All beef types presented a mean WBSF value of 5.4, and a sensory tenderness score of 5.45, between slightly and moderately tender. Both results indicate that this beef types will be well accepted by the Portuguese consumer, as others authors realized that beef with WBSF lower than 5.5 is well accepted by the Portuguese consumer [2,4].

Other authors reported that ageing periods higher than 7 days improve beef tenderness, sensory and instrumentally measured, but ageing periods longer than 11 days does not produce any additional improvement in tenderness [5]. All beef types had an ageing period long enough to allow the beneficial effect of the enzymatic activity of proteases on myofibrillar structure. The much longer ageing period of Brazilian beef was reflected in a higher MFI, but did not bring any additional tenderness improvement.

However, it could have diminished the differences that may have existed due to the *Bos indicus* nature of Brazilian beef. It is well known that *B. indicus* breeds are rated less tender and juicy than *Bos taurus* breeds, which seems to be associated with differences in muscle protein turnover in the living cattle. Nevertheless, differences obtained in juiciness value, probably resulted from the longer ageing period, as very long ageing periods cause an excessive myofibrillar fragmentation, and consequently decreased water holding capacity and therefore juiciness [6]. In general, chemical and physical parameters were not well correlated with sensory attributes, WBSF was well inversely correlated with tenderness ($r=0.50$), though. All sensory attributes were well correlated with overall acceptability. Tenderness and juiciness were positively correlated ($r=0.49$). It has been suggested that there is a “halo effect” between tenderness and juiciness, whereby a beef sample judged to be very tender would often also be judged as very juicy [7], as the tender beef is more easily juices are released from the spaces between the muscles fibres. Flavour was also well correlated with off-flavours ($r=0.44$). The highest off-flavour value presented by Brazilian beef could be also due to the highest ageing period, as during ageing enzymatic reactions can produce volatile compounds, which alter the flavour of beef [8]. In addition, the typical production system of Brazilian beef is based on grazing, and generally beef from pasture fed animals have more off-flavours than meat from concentrate fed animals. Also the nature of the pasture influences flavour and off-flavours production. From the results we realised that consumers’ expectations concerning beef quality did not match with the measured quality of the products, as consumers judged beef types differently according to credence attributes and visual appreciation. PDO, Brazilian and regular beef were perceived as having high, medium and low intramuscular fat content, respectively. Moreover, PDO beef was preferred over the other two beef types in terms of extrinsic cues (origin, brand and label information), and perceived as having higher expected quality than Brazilian and regular beef in all quality traits considered, i.e., taste, tenderness, juiciness, nutrition, healthiness and safety, which was not confirmed by the physic-chemical analysis.

Table 1 – Physical and chemical characteristics of LL muscle from PDO, Brazilian and regular

| Variables | PDO | | Brazilian | | Regular | | S |
|-------------------------|--------|-------|-----------|------|----------|------|----|
| | Mean | SEM | Mean | SEM | Mean | SEM | |
| pH | 5.63b | 0.023 | 5.78a | 0.04 | 5.78a | 0.04 | ** |
| L* | 33.69 | 0.62 | 33.5 | 0.71 | 33.3 | 0.86 | Ns |
| a* | 21.01 | 0.36 | 20.8 | 0.37 | 19.90 | 0.64 | Ns |
| b* | 3.83 | 0.39 | 4.44 | 0.28 | 3.39 | 0.58 | Ns |
| h* | 9.86 | 1.08 | 12.3 | 0.85 | 9.01 | 1.54 | Ns |
| C* | 21.41 | 0.39 | 21.3 | 0.37 | 20.7 | 0.48 | Ns |
| Pigment (%DM) | 1.61 | 0.08 | 1.50 | 0.11 | 1.79 | 0.16 | Ns |
| IMF (%DM) | 6.82 | 0.43 | 7.66 | 0.56 | 7.46 | 0.70 | Ns |
| Total Collagen (%DM) | 2.38 | 0.09 | 2.34 | 0.10 | 2.45 | 0.12 | Ns |
| Collagen solubility (%) | 17.42 | 0.63 | 18.30 | 0.77 | 17.40 | 1.13 | Ns |
| MFI | 51.56b | 6.50 | 76.8a | 6.71 | 57.50a,b | 4.37 | * |
| Cooking losses (%) | 27.04 | 1.04 | 28.70 | 1.06 | 28.40 | 0.84 | Ns |
| WBSF (kg) | 5.48 | 0.39 | 5.28 | 0.32 | 5.42 | 0.25 | Ns |

IMF=intramuscular fat; MFI=myofibrillar fragmentation index

IV. CONCLUSION

Considering the physical and chemical characteristics measured the three beef types were similar. The greatest differences between the three beef types were in sensory attributes with Brazilian beef presenting the worse score in juiciness, off-flavours and overall acceptability. Off-flavour strongly influenced the overall acceptability. Comparing consumer expectations and the physical and chemical characteristics measured it seems that they were not fulfilled. From this study it was realised that much has to be done in order to, by one hand, fulfil consumer expectations, and by other to improve communication related to beef quality to consumers in order they could make informed choices at the market place.

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