

SOUTH AFRICAN BEEF QUALITY AUDIT

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Abstract – Meat tenderness has been proven to be the most important factor to consumers when rating meat quality. It is therefore important to the meat industry to consistently produce tender meat which is priced accordingly. Various pre- and post-harvesting factors are known to affect meat tenderness, such as *post mortem* aging. Consumers perceive vacuum-packaged beef as aged beef and also relate price of a product positively to quality. In the preliminary stages of this beef audit we show that vacuum-packaging does not consistently result in a tender product and furthermore that there is no correlation between price per kilogram of the product and its tenderness in the South African urban meat market.

Key Words – vacuum-packaging, meat tenderness, price per kilogram.

I. INTRODUCTION

Consumer criteria for beef quality identifies a number of key properties that can be termed attributes of quality namely, visual appearance at the point of purchase (colour, fatness, packaging), eating quality or palatability and general health considerations [1]. Tenderness has been identified as the most important palatability attribute of meat, and thus, the primary determinant of overall meat quality and consumer satisfaction [2, 3]. Since various factors from the farm gate to the final cooked product affect not only tenderness but also other quality characteristics [4], presenting a product of consistently high quality is the culmination of the combined efforts of all role players in the industry to manage all the various quality factors. These factors include genetics, nutrition, growth promotants, pre-harvest stress, harvest technology (electrical stimulation, chilling), post-harvest conditions (duration of shelf life or aging, packaging, temperature) and cooking [5-14]. The success rate of the various sectors of the meat industry implementing these technologies, may vary due to factors such as technical skills and knowledge, the market sector, financial viability and others. The beef production chain is still hugely fragmented and so for

large parts of the industry the quality of the final product may vary and secondly the reasons for the variation are difficult to trace to a specific sector or role player. On the other hand, without previous knowledge of product quality, the consumer has to rely on clues such as appearance of the meat, packaging, price and label information to form an opinion of the product [15]. Vacuum-packed meat is normally perceived by the consumer as a high quality product [16]. In addition, Dransfield *et al.* [17] reported a positive relationship between consumers' willingness to pay and the price combined with favourable visual appearance of meat.

While new projects are designed to address quality challenges in the production process of meat, very little is known about the final quality of red meat offered to the consumer at various outlets.

The larger project aims at running a Beef Quality Audit to firstly determine the variation in quality (tenderness, colour, water properties and others) within and between different types of outlets and to attempt to verify the reasons for variation in quality so that research or technology transfer can address specific problems. In this paper initial data on the variation of shear force tenderness of vacuum-packed products in relation to price is presented.

II. MATERIALS AND METHODS

In the first round of the Beef Quality Audit, 14 samples were collected from the shelves of 13 outlets on 14 different dates over a 15 week period. The retail outlets were categorised as "food retailers" or "grocery stores" (G) and "butcheries" (B) and for the purpose of the report were numbered as G1 to G4 and B1 to B7, respectively. The "food retailers" can be described as large chain stores whose primary products are not meat only while the "butcheries" are defined as their primary business being the selling of meat. Porterhouse (boneless and also called sirloin or scotch fillet) or related cuts were purchased, the latter

meaning that in some cases porterhouse was not sold and club steak (bone in) was purchased instead. On rare occasions T-bone was purchased when club-steak was not available. Broadly speaking, the selected cut contained the *M. longissimus* of the hind quarter. For grocer 2 and 4, two products were sampled and numbered as G2a and G2b and G4a and G4b. All products were from a feedlot cattle except for G4a which was grass fed. All cuts were presented as vacuum-packed products by the outlets. None of the cuts from butcher outlets had any indication of ageing period before packaging, while certain food retailers had minimum ageing times stated on the package labels. G4a was aged for a minimum of 35 days, G3 and G4b for 28 days and G2a and G2b for 21 days. On the day of collection the products were stored at 2°C and Warner Bratzler shear force (WBSF) was performed the day after purchase on steaks oven broiled at 170 °C to an internal temperature of 70 °C [18]. Shear force was performed on 6 x 12.5 mm (diameter) cores removed from cooked steaks after cooling them down to room temperature.

Products from the different outlets were compared by frequency distribution of shear force values in five tenderness categories adopted from Miller *et al.* [19]. The first 2 categories (<3.3 kg and 3.3 – 4.2 kg) can be regarded as “very tender” and “tender”, respectively. The third category (4.3 – 5.2 kg), would not satisfy all consumers, while the fourth and fifth categories (5.3 – 6.3 kg and >6.3 kg) can be described as “tough” and “very tough”, respectively.

III. RESULTS AND DISCUSSION

According to Figure 1, only 2 out of 7 “butcherries” had more than 50 % (7 out of 14) steaks collectively in the 2 tender categories. Moreover, B7 had no steaks in these 2 categories and in the rest of the butcherries (except B1) 2 or 3 samples occurred in category 5, meaning that the consumer has a fair chance of selecting a very tough steak in all but B1. When only referring to “butchers” therefore, vacuum-packaging does not guarantee a consistently tender product. The “food retailers” showed a slightly more favourable picture with all 6 products from 4 stores having at least 50% samples in the 2 tender categories (Figure 2). Three products

from 2 stores had 50 % or more steaks in the very tender category (G2a, G2b and G4a). In contrast, G1 had a fairly even distribution of steaks over all 5 categories, therefore showing inconsistency. Furthermore, G1 had 5 (out of 14) samples in the tough categories (> 5.3) and every product except G4a had at least 1 sample in the 2 tough categories. In contrast to vacuum-packed products of “butcherries”, most of the products from “food retailers” are brand-named with claims of vacuum aging of at least 21 days to 35 days and one of these products included a beef breed brand name. Surprisingly, the most consistent product from these outlets was that of the free-range cuts, therefore older cattle, but it has to be added that this product was aged for 35 days. A survey done on beef tenderness in the USA [20] also found inconsistencies in tenderness and concluded it to be a result of insufficient aging post production.

In this audit, other than the few brand named products which guaranteed a specific number of days aged, the bulk of the products had no indication of time aged. The few that displayed both packed and sell by dates showed that a maximum of 14 days aging could occur but in some cases only 7 days.

Previous reports have indicated that consumers are brand loyal [21] but that in the absence of brand labels, when faced with steaks of a similar appearance, one third of consumers will pick the more expensive product with the assumption that the quality is superior [22]. The average price of vacuum-packed samples in this audit varied from R 63 / kg to R 108 / kg (US\$1=±R7.8, €1=±R10). By simple comparison it is clear that prices and quality, in terms of average tenderness or consistency in tenderness, did not correspond (Figure 3). A similar situation was reported for lamb in Australia [23] showing that this is a problem worldwide. For example, 10 out of the 14 products purchased from B4 at R63/kg were within the 2 tender categories while B7 which was more expensive had no products in the 2 tender categories. Unfortunately there were 3 very tough samples in the B4 product. The most expensive cut (G4a) had no cuts outside of the 2 tender categories and G2a that was the third most expensive product, recorded 13 of 14 cuts as tender and very tender but 1 as tough. However, of the 6 remaining products that sold at >R 90/kg the number of steaks recorded in the 2 tender categories varied

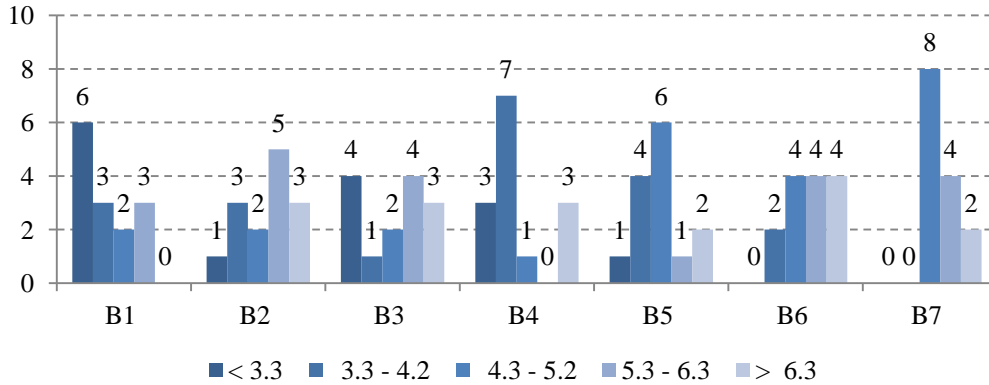


Figure 1. Distribution of Warner Bratzler shear force (WBSF) values among 5 tenderness categories (kg SF) for vacuum-packed loin steaks (out of 14) purchased at 7 different butcheries (Butcheries were randomly numbered from B1 to B7).

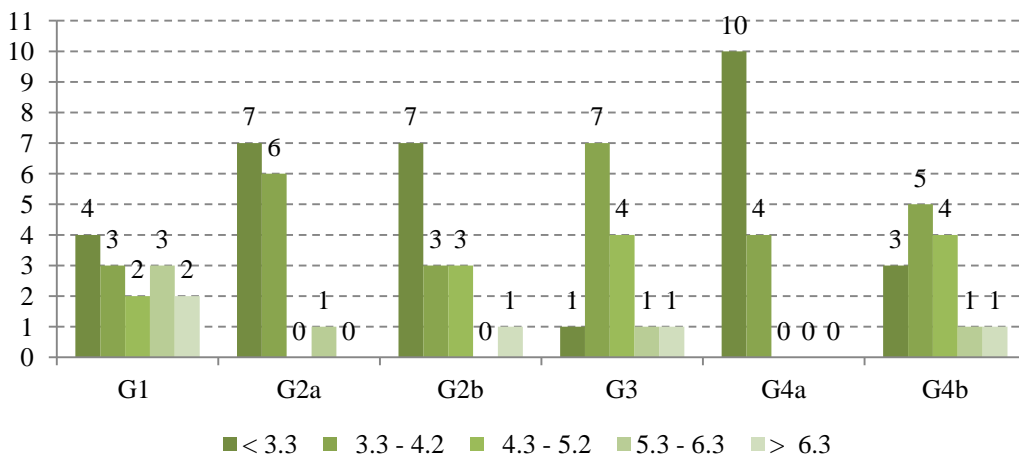


Figure 2. Distribution of Warner Bratzler shear force (WBSF) values among 5 tenderness categories (kg SF) for vacuum-packed loin steaks (out of 14) purchased at 4 different food retailers (Retailers were randomly numbered from G1 to G4 with "a" and "b" distinguishing 2 products per retailer).

between 5 and 10. G4b which sold at R107/kg had 2 products in the tough category and 4 in the category which would not satisfy all consumers. For the products sold between R80 and R89/kg between 7 and 8 of 14 cuts were recorded as tough or very tough, while the corresponding range for the products between R70 and R79/kg was between 3 and 6.

IV. CONCLUSION

This audit has so far shown that vacuum-packaging was no guarantee for tender meat. Products falling in the tough category ranged from 0 to 8 products out of 14. It is also a concern that price per kg did not correlate well with tenderness and is therefore not a guarantee to the consumer that a tender piece of meat has been purchased. In fact the cheapest product was more consistent in

tenderness than many of the more expensive ones.

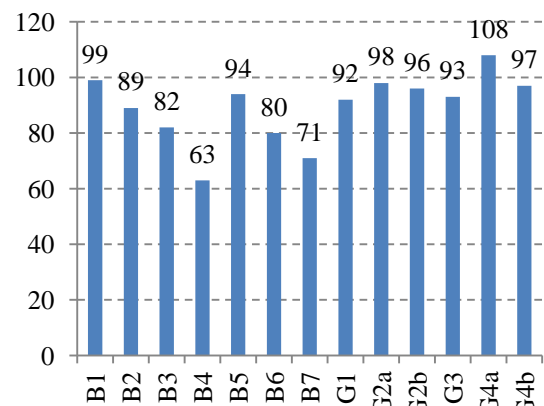


Figure 3. Mean values for price per kg for vacuum-packed samples

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