

# CONSUMER PERCEPTIONS AND INSTRUMENTAL MEASUREMENTS OF MUTTON QUALITY AT POINT OF PURCHASE IN THE EASTERN CAPE PROVINCE, SOUTH AFRICA

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**Abstract** – The present study determined the relationship between the perceptions of consumers and instrumental measurements of mutton quality at point of purchase. The study was conducted in five different municipalities in the Eastern Cape province of South Africa. A total of 215 consumers were interviewed at point of purchase in 40 different shops and butcheries selling meat. Mutton samples were collected from different shops in four different seasons and the following meat quality attributes colour ( $L^*$ ,  $a^*$  and  $b^*$ ), pH, tenderness and cooking loss were measured. Consumers perceived place of purchase and class of shop as crucial cues indicating meat quality, but quality attribute measurements indicated that there was no difference in meat quality purchased from these different classes of shops. Season had a significant on  $L^*$  values with the meat  $L^*$  value ( $24.7 \pm 0.49$ ) in winter being the lowest and ( $32.2 \pm 0.49$ ) in spring being the highest. Days to purchase had significant ( $P < 0.05$ ) negative correlations with tenderness and  $L^*$  values of the meat which is similar to consumer perceptions where the longer the storage days, the darker and softer the meat becomes.

**Key Words** - Days to purchase, Meat quality, Place of purchase

## I. INTRODUCTION

There are several studies on perceptions of consumers on meat quality [1; 3; 11], and according to [2], consumer evaluation of eating quality is the major determinant of purchasing decision. However, it is important to determine the physico-chemical quality of meat to see if it matches with the consumer expectations. According to [9] physico-chemical characteristics are some of the determinants of meat quality and its acceptability by consumers. Meat has physical and chemical attributes [10], with pH being the chemical attribute that is a good indicator of meat colour [7]. Physical attributes include tenderness, colour, cooking loss, flavour and juiciness of the meat.

At the point of purchase, the usual appeal of meat to consumers is important [5]. Colour is an important visual cue. The surface of meat changes from red to brown during retail display, due to the formation of metmyoglobin [6]. [13] highlighted that differences in meat colour depend upon several individual factors and their interactions. There are many studies which have been conducted prior to purchase looking at these individual factors [9; 8; 12; 4]. However, there is paucity of information on the factors that might have an effect on the quality of meat at points of purchase.

## II. MATERIALS AND METHODS

This study was conducted in five different municipalities situated in the Eastern Cape province of South Africa where a survey questionnaire was administered and conducted in 40 different shops, butcheries selling meat to a total of 215 consumers. Selected areas were categorized into urban and rural towns. The selection of consumers was limited mostly to those consumers who were directly purchasing mutton from shops and butcheries in the chosen areas, though some homesteads from the villages were also visited. Shops were classified as, top class, middle class, or ordinary butcheries. High class shops were defined as shops which are guaranteed to sell high quality products usually at a higher price. Middle class shops sell products that most consumers are at least able to afford; most of their products are not sold at a higher price. Ordinary butcheries / shops cater for consumers living under the poverty datum line, those whose majority of purchases is determined by the amount of disposable cash available. Questionnaires were administered randomly and consumers answered questions pertaining to meat purchasing decisions, preferred meat parts, and their ability to assess the quality of mutton by visual observation. Questions focussing on the quality of mutton and on consumer

health were also included. Different samples of mutton were purchased by the supervisor from the same shops as the consumers and these samples were subjected to laboratory analysis. Meat samples were collected in four different seasons and in each season, 120 meat samples with three replicates in each shop were collected. Four meat quality attributes were measured, (L\*, a\* and b\*), pH, meat tenderness and cooking loss. The (L\*, a\* and b\*) and pH measurements were taken at point of purchase using a Minolta colour-guide 45/0 BYK-Gardener GmbH machine and Crison pH 25, pH meter (Crison instruments, S.A., Alella, Spain). Cooking loss and tenderness evaluations were later determined. Warner Bratzler (WB) shear device mounted on an Instron (Model 3344) Universal testing apparatus was used to determine WBSF values. The chi-square test of SAS (2003) was computed to determine meat quality traits of sheep meat and factors influencing meat purchasing decisions. The physico-chemical meat quality parameters (pH, L\*, a\* and b\*, cooking loss, WBSF values) were analysed using (SAS) (2003) and the Generalized Linear Model was used.

### III. RESULTS AND DISCUSSION

In the present study consumers both from rural and urban areas agreed that place of purchase was one of the most important quality cues that can be used as a good indicator of mutton quality. Consumers agreed that where they go to purchase meat indicates the quality of meat that they buy. For an example, some consumers coming from rural areas believed that the meat that has been purchased from urban shops was of better quality than meat that they purchased from shops in rural areas conditions. In a study by [1] place of purchase was ranked as most helpful in assessing meat quality in the shop. Table 1 shows the effect of place of purchase on meat quality attributes at the point of purchase. There were no significant differences on L\*, a\*, b\* values, pH, tenderness values of the meat that was bought from urban and rural shops. This can be due to fact that these different shops purchased meat from the same source, same abattoirs therefore differences at point of purchase can only depend on the storage conditions of which most of the time meat samples at shops are stored under same temperatures. Significant differences on shop types were observed only in cooking loss. Results from the laboratory analysis of meat quality indicated

that place of purchase cannot be used as a good indicator of meat quality.

Table 1. Mean values ( $\pm$  SE) for meat quality attributes of mutton from different purchasing points

| Parameter        | Urban                        | Rural                        | Significance level |
|------------------|------------------------------|------------------------------|--------------------|
| Lightness (L*)   | 28.6 $\pm$ 0.42 <sup>a</sup> | 28.8 $\pm$ 0.50 <sup>a</sup> | NS                 |
| Redness (a*)     | 16.6 $\pm$ 0.68 <sup>a</sup> | 15.1 $\pm$ 0.81 <sup>a</sup> | NS                 |
| Yellowness (b*)  | 11.0 $\pm$ 0.13 <sup>a</sup> | 10.8 $\pm$ 0.16 <sup>a</sup> | NS                 |
| pH               | 6.0 $\pm$ 0.02 <sup>a</sup>  | 6.0 $\pm$ 0.02 <sup>a</sup>  | NS                 |
| WBSF (N)         | 19.2 $\pm$ 0.45 <sup>a</sup> | 19.6 $\pm$ 0.54 <sup>a</sup> | NS                 |
| Cooking Loss (%) | 35.0 $\pm$ 0.68 <sup>a</sup> | 32.0 $\pm$ 0.81 <sup>b</sup> | **                 |

<sup>ab</sup>Means in the same row without the same superscripts are significantly different ( $P < 0.05$ )

The effect of type /class of shop where meat was bought is shown in Table 2. The type of shop was found to have a significant effect on b\*, pH, and cooking loss of meat. There were no significant effects observed on L\*, a\* and WBSF values of the meat. These results were not expected as consumers interviewed in this study believed that class of shop has got an effect on meat quality, with meat that has been purchased from top class shops being perceived to be of better quality. The reason for this perception is they assumed that the treatment is not the same hence the standard of the shops are assumed not to be the same.

Table 2. Mean values ( $\pm$  SE) for meat quality attributes of mutton purchased from different classes of shops.

| Parameter           | Type of shop                 |                              |                              |
|---------------------|------------------------------|------------------------------|------------------------------|
|                     | Top Class                    | Middle Class                 | Butcheries                   |
| Lightness(L*)       | 28.1 $\pm$ 0.49              | 27.3 $\pm$ 0.84              | 27.8 $\pm$ 0.28              |
| Redness (a*)        | 15.3 $\pm$ 0.86              | 15.1 $\pm$ 1.46              | 16.3 $\pm$ 0.49              |
| Yellowness(b*)      | 11.5 $\pm$ 0.19 <sup>a</sup> | 11.1 $\pm$ 0.33 <sup>b</sup> | 10.6 $\pm$ 0.11 <sup>c</sup> |
| pH                  | 6.09 $\pm$ 0.02 <sup>b</sup> | 6.16 $\pm$ 0.04 <sup>a</sup> | 6.04 $\pm$ 0.01 <sup>b</sup> |
| WBSF(N)             | 20.5 $\pm$ 0.67              | 20.3 $\pm$ 1.15              | 19.4 $\pm$ 0.38              |
| Cooking Loss (CL %) | 26.5 $\pm$ 0.56 <sup>a</sup> | 24.6 $\pm$ 0.45 <sup>b</sup> | 24.9 $\pm$ 0.63 <sup>b</sup> |

<sup>abc</sup>Means in the same row without the same superscripts are significantly different ( $P < 0.05$ )

# WBSF (N) - Warner Bratzler Shear Force

Consumers believed that season had an effect on meat quality, with meat sold during summer and winter having some differences. Consumers reported that they purchased red meat more often in winter compared to summer or hot seasons. Results from laboratory measurements on effect of season are shown in Table 3. There were significant seasonal effects ( $P < 0.05$ ) on the  $L^*$ , tenderness, pH, and cooking loss of meat. However,  $b^*$  and  $a^*$  values of the meat were not affected by season. The pH was highest in winter and in autumn and lowest in summer and spring. The  $L^*$  values for meat purchased in winter were the lowest meaning meat samples sold were darker. Reasons for the lowest  $L^*$  values could be due to pre-slaughter conditions whereby the animals during winter season were subjected to low temperatures and because of the cold it resulted in animals being stressed. Stress in animals resulted in meat with a high  $pH_u$  which is the reason for the low  $L^*$  values or dark colour in mutton samples purchased in winter.

Table 4 shows correlations between days to purchase and meat quality characteristics. Days to purchase had significant ( $P < 0.05$ ) negative correlations with tenderness and  $L^*$  values of the meat. This therefore means that the longer the storage period the softer and darker the meat, and is in line with consumer perceptions where they agreed that the longer the storage days of meat in shelves it's colour changes. Significant negative correlations between days to purchase and pH were observed. Significant negative correlations between  $L^*$  and WBSF values of meat were also observed. There were negative ( $P < 0.05$ ) correlations between pH and colour of the meat ( $L^*$ ,  $a^*$  and  $b^*$ ).

Table 3. Mean values ( $\pm$  SE) for colour ( $L^*$ ,  $a^*$  and  $b^*$ ), pH, tenderness and cooking loss% of mutton in different seasons.

| Parameter                            | Season                       |                               |                              |                              |
|--------------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|
|                                      | Spring                       | Summer                        | Autumn                       | Winter                       |
| <b>Lightness (<math>L^*</math>)</b>  | 32.2 $\pm$ 0.49 <sup>a</sup> | 26.9 $\pm$ 0.49 <sup>b</sup>  | 26.8 $\pm$ 0.4 <sup>7b</sup> | 24.7 $\pm$ 0.4 <sup>9c</sup> |
| <b>Redness (<math>a^*</math>)</b>    | 17.8 $\pm$ 0.85              | 14.8 $\pm$ 0.86               | 15.3 $\pm$ 0.8 <sup>1</sup>  | 15.9 $\pm$ 0.8 <sup>6</sup>  |
| <b>Yellowness (<math>b^*</math>)</b> | 10.8 $\pm$ 0.19              | 10.9 $\pm$ 0.19               | 11.1 $\pm$ 0.1 <sup>9</sup>  | 10.7 $\pm$ 0.1 <sup>9</sup>  |
| <b>pH</b>                            | 5.9 $\pm$ 0.02 <sup>c</sup>  | 5.9 $\pm$ 0.02 <sup>c</sup>   | 6.2 $\pm$ 0.02 <sup>b</sup>  | 6.4 $\pm$ 0.02 <sup>a</sup>  |
| <b>WBSF (N)</b>                      | 17.7 $\pm$ 0.65 <sup>c</sup> | 20.7 $\pm$ 0.66 <sup>ab</sup> | 19.7 $\pm$ 0.6 <sup>3b</sup> | 21.2 $\pm$ 0.6 <sup>6a</sup> |
| <b>Cooking Loss (CL %)</b>           | 28.8 $\pm$ 0.88 <sup>d</sup> | 35.2 $\pm$ 0.8 <sup>9b</sup>  | 37.5 $\pm$ 0.8 <sup>5a</sup> | 30.7 $\pm$ 0.8 <sup>9c</sup> |

<sup>abcd</sup>Means in the same row without the same superscripts are significantly different ( $P < 0.05$ )

Table 4. Correlations between days to purchase and meat quality characteristics of mutton

|                      | pH    | Yellowness ( $b^*$ ) | Redness ( $a^*$ ) | Lightness ( $L^*$ ) | Days to purchase |
|----------------------|-------|----------------------|-------------------|---------------------|------------------|
| Tenderness           | 0.05* | 0.16                 | 0.01              | -0.15*              | -0.09*           |
| pH                   |       | -0.06                | -0.09             | -0.16               | -0.12**          |
| Yellowness ( $b^*$ ) |       |                      | 0.05              | -0.06               | -0.08            |
| Redness ( $a^*$ )    |       |                      |                   | -0.09               | -0.01            |
| Lightness ( $L^*$ )  |       |                      |                   |                     | 0.19**           |

Significantly correlated at \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

Differences between urban and rural consumers on primary factors that they consider when making purchasing decisions are shown in Figure 1. Most of the rural consumers considered price as the most important primary factor they use when purchasing meat in a retail store. Quality of the product was considered after price, and the health aspect was the least important factor. Urban consumers considered health as the most important primary factor followed by quality, and the price of the product. According to [12] this can largely be due to the fact that respondents from rural and poor backgrounds, most of

their purchases are determined by the amount of disposable cash available. Reasons for rural consumers to rate health as the least primary factor can be due to the fact that most urban consumers were more knowledgeable on the risks concerning their health. Both consumers groups agreed they do not consider the type of packaging used when purchasing meat in a retail store.

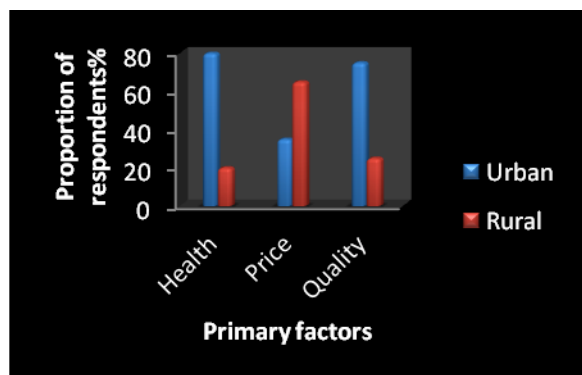


Figure 1. Primary factor influencing meat purchasing decision of consumers

#### IV. CONCLUSION

The perceptions of consumers was related to the physico-chemical quality of meat that has been measured at points of purchase but some consumers believed that place of purchase and class of shop have an effect on meat quality although instrumental meat quality attributes results contradicted with this perception.

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