

Full Length Research Paper

Effects of different cooking methods on the consumer acceptability of chevon

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Consumers expect the meat products on the market to have the required nutritional value, be wholesome, fresh and lean and have adequate juiciness, flavour and tenderness. A study was conducted to establish consumer acceptability of chevon prepared using different traditional cooking methods in terms of acceptance of flavour, tenderness, off-flavour, aroma intensity and juiciness through sensory evaluation. A panel of 48 participants drawn from the University of Fort Hare student body of different tribes was used. There was a significant association ($P < 0.05$) between aroma intensity scores and the different tribes. Majority of the Xhosa, Shona and Zulu panelists had higher aroma intensity scores whereas the Ndebele panelist gave low aroma intensity scores. Cooking methods significantly ($P < 0.05$) affected all the sensory attributes under consideration. Goat meat mixed with vegetables and the intestines had the highest mean sensory scores all round. The high connective tissue in the meat did not significantly ($P < 0.05$) affect the panelist scores for tenderness. In conclusion, cooking methods was observed to have a bearing on the acceptability of chevon by consumers and should be taken into consideration when preparing chevon for home consumption and for promotion.

Key words: Aroma, boiling, consumer background, flavour, gender, indigenous goat, roasting, tenderness.

INTRODUCTION

Chevon is red meat that is often viewed as potential competitor to beef and sheep meat (Simela and Merkel, 2008). Chevon is almost universally acceptable but with cultural traditions and social and economic conditions influencing consumer preference (Webb et al., 2005; Xazela et al., 2011). Chevon also offers a reasonable economic option for agriculture and diversification under conditions suitable for ruminants (Webb et al., 2005). A cross culture-education-ethnic study in multicultural South Africa revealed that the use of goat meat is linked to (African) cultural activities (Mahanjana and Cronje, 2000). According to Simela et al. (2008), most sensory evaluations of chevon that employed trained taste panels generally showed that chevon and chevon products are of high quality. Chevon has also been reported to contain higher collagen and has lower solubility than sheep meat

and its intramuscular connective remains unchanged during postmortem aging (Kannan et al., 2005).

An increase in consumer demand for high quality products has led to a growth in the use of new cooking methods and technologies that satisfy the consumer needs (Garcia-Segovia et al., 2007). Generally, meat is usually cooked before it is eaten, which result to important physical changes in the meat texture that may affect consumer perception of the meat. Although, factors such as health concerns, changes in demographic characteristics, the need for convenience, changes in distribution systems, price and cultural values can affect consumer acceptability of goat meat, cooking methods could also have a significant impact on eating quality and general acceptability of goat meat (Resurreccion, 2003). Above this, cooking method could change the nutritional value, freshness, juiciness, flavour and tenderness of meat resulting in varied perceptions of goat meat by different sections of the society (Hoffman and Wiklund, 2006).

In general, very little goat meat is consumed in South

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Table 1. Mean scores for aroma intensity, initial impression of juiciness, first bite and sustained impression of juiciness of goat meat cooked in four different ways.

Sensory attribute	Plain	Mixed with vegetable	Roasted	Intestine
Aroma intensity	5.12 ± 0.22 ^b	5.22 ± 0.22 ^b	5.71 ± 0.22 ^a	6.35 ± 0.22 ^a
Initial juiciness	4.62 ± 0.19 ^b	6.10 ± 0.19 ^a	4.25 ± 0.19 ^b	6.25 ± 0.19 ^a
Sustained juiciness	5.21 ± 0.19 ^{bc}	5.75 ± 0.19 ^{ab}	4.6 ± 0.19 ^c	6.4 ± 0.19 ^a
First bite	5.45 ± 0.21 ^b	6.29 ± 0.2 ^a	5.16 ± 0.2 ^b	6.52 ± 0.2 ^a
Tenderness	5.33 ± 0.18 ^b	5.77 ± 0.18 ^a	5.19 ± 0.18 ^b	6.41 ± 0.18 ^a
Amount of connective tissue	4.38 ± 0.22 ^{bc}	5.19 ± 0.22 ^{ab}	4.25 ± 0.22 ^b	5.42 ± 0.22 ^a
Overall flavour intensity	5.29 ± 0.21 ^b	5.42 ± 0.21 ^a	5.33 ± 0.21 ^a	6.08 ± 0.21 ^a
Off-flavour intensity	3.19 ± 0.21 ^a	2.17 ± 0.21 ^b	3.27 ± 0.21 ^a	3.92 ± 0.21 ^a

Means within a row having different superscripts are significantly different ($P < 0.05$).

Africa and there has been only limited research on the qualities and acceptability of chevon by consumers. Additionally, whether (and to what extent) such consumer acceptability would be influenced by cooking methods has not been documented. Therefore, the objective of the study was to evaluate consumer acceptability of chevon prepared using different traditional cooking methods in terms of acceptance of flavour, tenderness, off-flavour, aroma intensity and juiciness.

MATERIALS AND METHODS

Site description

The study was conducted at Honeydale Research Fort Hare farm. The farm is located 5 km east of the town of Alice, Eastern Cape, South Africa and is 520 m above sea level. It is located 32.48° latitude and 26.53° longitude. It is situated in the False Thornveld of the Eastern Cape, and the vegetation is characterised by several trees, shrubs, and grass species with *Acacia karroo*, *Themeda triandra*, *Panicum maximum*, *Digitaria eriantha*, *Eragrostis spp.*, *Cynodon dactylon*, and *Pennisetum clandestinum* being the dominant plant species. The average rainfall is approximately 480 mm per year, and mostly comes in summer. Mean temperature of the farm is about 18.7°C per year. The topography of the area is generally flat with a few steep slopes.

Meat sample cooking

A carcass from the non-descript indigenous goat breed raised on natural pastures was used for this experiment. The goat was stunned and humanely slaughtered using traditional procedures at the University of Fort Hare farm slaughter facility. After skinning and evisceration, the dressed carcass was weighed and chilled for 24 h. Together with the offals (intestines and tripe), meat from the shoulders, thighs and the lumber region including the *longissimus dorsi* and ham muscles were used for sensory analysis. The meat from the different regions was dissected and diced into fragments of about 3 by 3 cm, mixed together and divided into four equal portions aligned to the four cooking methods: 1) meat boiled in water with salt added for 1 h; 2) salted meat roasted; 3) salted meat boiled mixed with vegetables; and 4) boiled with intestines and tripe. Boiling in all cases was done for 1 h while roasting was done until the meat was ready for consumption.

Sensory evaluation

Meat from each method was evaluated alone and tasting for each method was done randomly by a consumer panel composed of students at the University of Fort Hare (a total of 48). The panellists were of different gender (28 males and 20 females), ages (average age 21 ± 2.32) and tribes (Shona, Xhosa, Zulu and Ndebele). All the participants were taught how to infer and record scores for each variable tasted. The waiting period between meat sample tasting was 10 min. After tasting, the panellists were instructed to rinse their mouth with water before tasting the next sample to avoid crossover effects. Each participant completed evaluation form rating the characteristics of each sample.

Eight point descriptive scales were used to evaluate aroma intensity (1 = extremely bland to 8 = extremely intense), initial impression of juiciness (1 = extremely dry to 8 = extremely juicy), first bite (1 = extremely tough to 8 = extremely tender), sustained impression of juiciness (1 = extremely dry to 8 = extremely juicy), muscle fibre and overall tenderness (1 = extremely tough, to 8 = extremely tender), amount of connective tissue (1 = extremely abundant to 8 = none), overall flavour intensity (1 = extremely bland to 8 = extremely intense) and off-flavour intensity (1 = none to 8 = extremely intense) (ISO 8586-1, 1993). The off-flavour indicators were livery/bloody, cooked vegetable, pasture/grassy, animal like/kraal (manure), metallic, sour and unpleasant.

Statistical analyses

The effect of cooking method on aroma intensity, initial impression of juiciness, first bite, sustained impression of juiciness, fibre and overall tenderness, amount of connective tissue, overall flavour intensity and relevant off-flavour intensity was analyzed using the general linear model procedure of SAS (2003). Tukey's HSD procedure was used for comparison of means.

RESULTS AND DISCUSSION

Cooking method significantly affected the sensory scores for aroma intensity, juiciness and first bite of Chevon (Table 1). Panelists scored roasted meat and intestines having significantly higher ($P < 0.05$) aroma intensity scores than the plain and mixed with vegetable. Aroma of the roasted meat and intestines did not differ ($P < 0.05$) whilst that of plain cooked meat and that mixed with

Table 2. Gender perceptions of the effect of cooking methods on some important sensory attributes

Gender	Plain	Mixed with vegetable	Roasted	Intestine
Aroma intensity				
Male	4.6 ± 0.08 ^a	4.6 ± 0.07 ^a	5.6 ± 0.03 ^b	5.7 ± 0.07 ^a
Female	5.5 ± 0.11 ^b	5.8 ± 0.11 ^b	4.3 ± 0.06 ^a	4.2 ± 0.07 ^b
Initial and sustained impression of juiciness				
Male	4.5 ± 0.08 ^a	4.8 ± 0.08 ^a	5.1 ± 0.06	4.6 ± 0.07
Female	4.9 ± 0.11 ^b	5.6 ± 0.11 ^b	5.0 ± 0.06	4.2 ± 0.07
Muscle fibre and overall tenderness				
Male	5.1 ± 0.07 ^a	4.7 ± 0.07 ^a	5.2 ± 0.07	4.2 ± 0.07
Female	5.5 ± 0.09 ^b	5.3 ± 0.09 ^b	5.1 ± 0.07	4.4 ± 0.07
Amount of connective tissue (residue)				
Male	4.8 ± 0.07 ^a	4.6 ± 0.06 ^a	4.2 ± 0.07	3.9 ± 0.07 ^a
Female	5.3 ± 0.10 ^b	4.9 ± 0.10 ^b	4.6 ± 0.07	4.6 ± 0.07 ^b

Values within column with different superscript are significant different ($P < 0.05$).

vegetables were similar. In terms of both initial impression of juiciness and sustained impression of juiciness scores, the meat mixed with vegetables and intestines were rated significantly ($P < 0.05$) superior to the plain cooked meat and the roasted meat. The plain cooked meat was regarded as moderately juicier whilst the roasted meat had the lowest sustained impression of juiciness scores. However, first bite scores showed that the meat mixed with vegetables and the intestines were more soft and tender than the cooked plain and roasted ($P < 0.05$). Ideally, meat quality levels combine the capacity to retain high nutritional value in the cooked form and to excel in functional roles such as flavor development, tenderness and juiciness of the cooked product among other roles (Muchenje et al., 2008a, 2009c).

Muscle fibre and overall tenderness, amount of connective tissue, overall flavour intensity and relevant atypical flavor were significantly ($P < 0.05$) affected by cooking method. Muscle fibre and overall tenderness scores indicated that the panelists regarded meat mixed with vegetables and the intestines as highly tender ($P < 0.05$) compared to the plain cooked and roasted which were moderately tender to tough. Sensory tenderness score is direct reflection of the shear force values. Generally, overall tenderness is closely associated with the amount of connective tissue in meat (Kannan et al., 2005; Calkins and Hodgen, 2007; Muchenje et al., 2008b). Although, the meat mixed with the vegetables and the intestines had significantly ($P < 0.05$) abundant connective tissues than the plain cooked and roasted meat, it seemed that the connective tissue abundance did not affect panelist scores for the overall tenderness. This therefore support the previous observations that amount of connective tissues alone is insufficient to explain

tenderness of goat meat (Muchenje et al., 2008b). Factors such as cooking method, fat content, muscle fibre composition, electrical stimulation and aging regime also can affect tenderness (Dzudie et al., 2000; Muchenje et al., 2008a, 2009c).

Overall flavour intensity and relevant off-flavour intensity were closely associated with cooking method. Mean overall flavour intensity scores for the four cooking methods were generally moderate though the plain cooked meat had significantly low ($P < 0.05$) scores than the other three. Relevant off-flavour refers to the flavour that is present over and above typical flavour such as livery, bloody, metallic, grassy, and cooked vegetables (Meinert et al., 2007; Muchenje et al., 2008b; 2010). Mean relevant off-flavour scores for all cooking methods were generally low with the meat mixed with vegetables significantly having the lowest score. The low score for meat mixed with vegetables could be due to the masking effect caused by vegetable compounds. Webb et al. (2005) observed that goat meat is highly suitable for making traditional meals that would appeal to consumers whether or not they are accustomed to eating goat meat.

More often than not, consumer perceptions on the acceptability of meat are linked to socio-cultural factors, especially in the African context. Although, goat meat and meat products are also of satisfactory eating quality, factors such as gender, tribe and age tend to affect acceptability of chevon from one community to the next (Mahanjana and Cronje, 2000; Dyubele et al., 2010; Chulayo et al., 2011). Results from this study suggest that female consumers tend to give higher scores in most of the sensory attributes and hence find chevon more acceptable (Table 2). Similar observations were also made by Simela et al. (2008), Rousset et al. (2005, 2008) and Xazela et al. (2011). The effect of tribe was also

Table 3. Perceptions of different tribes of the effect of cooking methods on some important sensory attributes.

Tribe	Plain	Mixed with vegetable	Roasted	Intestine
Aroma intensity				
Xhosa	4.7 ± 0.09 ^a	4.9 ± 0.09	5.1 ± 0.09	5.0 ± 0.09
Shona	5.3 ± 0.15 ^b	5.0 ± 0.13	5.4 ± 0.13	5.1 ± 0.13
Zulu	5.1 ± 0.13 ^b	4.7 ± 0.13	5.2 ± 0.13	5.0 ± 0.13
Initial and sustained impression of juiciness				
Xhosa	4.5 ± 0.09 ^a	4.7 ± 0.09	5.1 ± 0.08	4.8 ± 0.09
Shona	4.9 ± 0.14 ^b	5.0 ± 0.14	5.1 ± 0.12	5.2 ± 0.14
Zulu	4.7 ± 0.15 ^b	4.9 ± 0.15	5.4 ± 0.15	4.9 ± 0.15
Muscle fibre and overall tenderness				
Xhosa	4.9 ± 0.08 ^a	4.8 ± 0.08	4.9 ± 0.08	4.7 ± 0.08
Shona	5.5 ± 0.13 ^b	5.3 ± 0.12	4.9 ± 0.12	5.0 ± 0.12
Zulu	5.6 ± 0.14 ^b	5.0 ± 0.14	5.1 ± 0.14	4.9 ± 0.14
Amount of connective tissue (residue)				
Xhosa	4.7 ± 0.09 ^a	4.5 ± 0.09	4.6 ± 0.08 ^a	4.8 ± 0.09
Shona	5.0 ± 0.14 ^a	5.3 ± 0.14	4.5 ± 0.13 ^a	5.1 ± 0.14
Zulu	5.5 ± 0.15 ^b	5.1 ± 0.15	4.9 ± 0.15 ^b	5.0 ± 0.15

Values within column with different superscript are significant different ($P < 0.05$).

apparent.

The Shona and Zulu panelists gave higher scores for all sensory scores than the Xhosa panelists (Table 3). The low rating given by the Xhosas could be attributed to characteristic nature of the Xhosa tribe who generally prefer mutton over goat meat because of cultural reasons as observed in other studies (Radder and le Roux, 2005; Krystallis and Arvanitoyannis, 2006; Dyubele et al., 2010). Generally, the common culture of a particular tribe in any community is the most likely the overriding reason on the perceptions of the goat meat and the cooking methods used (Resurrección, 2003; García-Segovia et al., 2007). The culture of a community is in itself a very complex phenomenon influenced by available resources, pragmatic practices and beliefs (Webb et al., 2005). The consumption of goats can therefore be affected by gender, regions and the eating habits of different communities as reported elsewhere (Webb et al., 2005; García-Segovia et al., 2007).

Conclusion

The findings obtained from this study clearly show that cooking method affect sensory quality of goat meat. Goat meat mixed with vegetables and the intestines had the highest scores all round. The high connective tissue in the meat did not affect the panelist scores for tenderness. Off-flavour scores were on the acceptable end. The

findings from the study however could have been improved if, pH, cooking loss, shear and other meat quality attributes had been taken into consideration.

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