Lamb and Mutton Quality Audit

10/08/2018

South African Retail Lamb and Mutton Quality Audit

Industry Sector: Cattle And Small Stock

Research Focus Area: Animal Products, Quality And Value-Adding

Research Institute: Agricultural Research Council – Animal Production Institute

Researcher: Dr Michelle Hope-Jones

The Research Team

Title	Initials	Surname	Highest Qualificaion
Dr	PE	Strydom	Ph.D Animal Science
Dr	L	Frylinck	Ph.D Biochemistry
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Prof	A	Hugo	Ph.D Biochemistry
Ms	J	Anderson	N D Analytical Chemistry
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Year Of Completion : 2018

Aims Of The Project

- To measure the instrumental/physical quality (shear force tenderness, water holding capacity/cooking loss, fat and muscle colour, collagen properties, oxidative status (rancidity)), sensory qualities and chemical composition of lamb and mutton rib or loin chops (M. longissimus dorsi) from various retail outlets (including brand names and generic products).
- To determine the reasons for variation in quality by chemical, histological, physical and biochemical tests.
- To use the information from 3.1 and 3.2 to arrive at a list of factors needed to be addressed in research and/or technology transfer to improve meat quality in South Africa.

Executive Summary

Twenty three products (lamb loin chops) were identified and collected from the shelves of five major retail outlets and twelve smaller butcheries on 14 different dates over a three month period (n=306, certain products where not always available due to drought conditions). Products varied in type, namely Karoo lamb (lamb valued for it unique flavour attributes due to grazing on herbaceous bushes and shrubs from a particular region of South Africa), free range or feedlot. Products also varied in packaging (Modified

atmospheric packaging: MAP, PVC overwrap, to openly displayed on shelves) and retailers and butcheries were spread over various socio-economic areas. Price was recorded and shear force tenderness, sensory evaluation (tenderness and flavour), colour of meat, drip loss, cooking losses and meat/fat/bone ratios were measured as properties valued by consumers at or after purchase. Physical, histological and biochemical measurements (proximate and fatty acid analyses, lipid oxidation and collagen) were performed in an attempt to explain variations in consumer related properties.

- Both instrumental and sensory evaluations showed tenderness to be at a high level of acceptance across the board. The Karoo samples were the most tender with the free-range samples performing the worst especially with regard to sensory tenderness.
- Karoo lamb stood out for 'barnyard' aroma and flavour while free-range samples stood out for 'Karoo bossie" aroma and flavours meaning they could be distinguished from the other samples and from each other. In both cases however, the scores were of a low intensity. Karoo and free-range lamb are purchased for their distinctive flavour.
- Karoo and free-range samples lost less drip during cooking compared to the remaining products. Thawing loss was very low in general for all the products.
- Karoo and free-range products have more loin muscle and less fat per chop compared to feedlot products.
- Colour of all products was at an acceptable level with no distinct pattern showing for any particular product.
- Lipid oxidation was at a good level over all products and fatty acid profile were consistent with free-range vs. grain-fed products. This makes the lack of free-range and Karoo flavours more perplexing.
- Karoo and free-range products were more expensive. Regarding the remaining products, price correlated more with socio-economic area and butchery vs. retailer.
- In general lamb is of a good quality except for drip loss which needs to be attended to. This could be due to incorrect abattoir practices. Karoo lamb is sold at a premium and its lack of flavours is of concern. The consumer however is able to consistently buy tender loin chops at any retailer or butchery.

Popular Article

Quality Audit Of South African Lamb

Dr Michelle Hope-Jones, Researcher: Animal Production Institute, Food Science and Technology Department

Meat tenderness and other quality traits are influenced by a combination of pre-harvest, slaughter and post-harvest conditions and interventions. Research addresses these factors in order to ensure maximum satisfaction for the consumer.

However, the success rate of various sectors of the meat industry to use these technologies may vary depending on factors like technical skills, knowledge, market sector, financial viability and others.

While new projects are designed to address quality challenges, very little is known about the quality of red meat offered to the consumer at various outlets. To this end, a lamb audit was recently conducted to determine the variation in quality (tenderness, colour, water properties and others) within and between different types of outlets, and also to attempt to verify the reasons for variation in quality, so that research or technology transfer can address specific problems.

Product auditing process

The fact that meat in general is distributed all over the country from various production and processing plants, and considering that much of those operations are in Gauteng and distribute to Pretoria outlets, the study was limited to proper sampling and testing within the Pretoria metropolis. All the selected outlets receive meat from different operations, assuring a reliable sample of the industry.

Twenty three products (lamb loin chops) were identified and collected (when available) from the shelves of five major retail outlets (R) and twelve smaller butcheries (B) on 14 different dates over three months (n = 306). Products varied in type, namely Karoo lamb (valued for its unique flavour attributed to grazing on herbaceous bushes and shrubs from a particular region of South Africa), as well as free range and feedlot lamb.

Products also varied in packaging, from modified atmospheric packaging (MAP), where high levels of oxygen are pumped into packages in order for the meat to maintain the desirable red colour that consumers prefer, to PVC overwrap, and also open products displayed on shelves.

Retailers and butcheries were spread over various socio-economic areas.

Evaluation of palatability

The palatability of meat is determined by a combination of tenderness, juiciness and meat flavour.

Tenderness and juiciness

Tenderness is the most variable quality characteristic and is also rated by consumers as the most important sensory attribute. Figure 1 shows that purchasing from retailers vs. butcheries had little effect on tenderness, with instrumental test levels (Warner Braztzler Shear Force, WBSF) being at an acceptable level across all outlets. All of the Karoo products however were more tender. This could be attributed to the use of growth promotants in feedlots.

There was a strong correlation between sensory tenderness (rated by a trained panel) and WBSF. Two of the Karoo products, R2K and B6K, stood out as being more tender.

One of the free range products, R5FR, performed poorly on tenderness, but also scored lower for juiciness. This could probably be attributed to abattoir processes. Increased juiciness can give the perception of a more tender product and the relationship between the two attributes can clearly be seen in the figure. Most of the products which scored low for sensory tenderness (tougher), scored low for juiciness too.

Hoewever, the overall good level of tenderness is good news for the industry.

Flavour and aroma

In the case of lamb, flavour and aroma can play as an important role as tenderness. This is especially the case when comparing free range lamb to feedlot lamb (grass-fed vs. grain-fed) and even more so with Karoo lamb, which has a very specific flavour and aroma. As expected, the three Karoo samples scored higher (a more intense aroma) for ‘barnyard’ aroma, although interestingly not for ‘*Karoobossie’* aroma, except for one Karoo product. The opposite was found for the two free range products, which had higher ‘*Karoobossie’* aroma when compared to the Karoo products, but did not have a strong ‘barnyard’ aroma.

When looking at the flavour profiles, once again the three Karoo samples stood out as having a stronger ‘barnyard’ flavour. The Karoo samples did not really stand out as having a ‘Karoobossie’ flavour. As Karoo lamb is sold at a premium for its very distinct flavour, it would therefore be expected for this flavour to come out strongly. Instead, the taste panel identified the Karoo samples more as grass-fed meat.

Drip loss

All the free range products, as well as two of the Karoo products (R2K and B6K), had much less drip loss (the liquid you would find in the tray) compared to the other products. In fact, they had just over half the drip loss compared to the product with the most drip (R4).

Colour

All products across the board fell into the distinctly brown category. It was expected that packaging, or whether a sample was cut fresh or was on display, would make a difference to the colour of the meat, but not even the MAP packaged samples were of a desirable colour. This is of concern as consumers rely on visual appearance at the point of purchase and meat with a bright cherry red colour is associated with freshness.

Fat and meat (muscle) ratio, price

Figure 2 shows the average percentage of fat and the actual muscle for loin chops from the various outlets. All the Karoo (K) and free range (FR) products had more meat (a greater percentage of loin muscle), compared to the other products. It was however slightly unexpected, as feedlot meat production employs beta-adrenergic agonists, which should increase muscle yield and decrease fat percentage.

However, the feedlot lamb still had a higher percentage of fat compared to Karoo and free range samples, which could overshadow the increase in muscle yield of feedlot samples. Fat percentage followed a pattern of decreasing with an increase in loin muscle, with the Karoo and free range samples having less fat.

Price

There was a strong correlation between price and loin muscle, with a larger percentage of loin muscle resulting in an increase in price.

The Karoo and free range products were markedly more expensive, except for R2K (which was sold at a lower level retail store which was more accessible to the bulk of the public). All other Karoo products were sold at butcheries in areas of increased socio-economic status. The area in which the products were bought and the type of retailer/butchery that it was bought from, seem to be more of an indicator of price, than the percentage loin muscle, with stores in higher income areas charging more.

Problems to be addressed

With lamb being an expensive product, it is good to see that the consumer can consistently buy a tender product. There are, however, a few problems which were identified.

- Karoo lamb, which is sold as a speciality product, does not consistently stand out from other free range products.
- Colour as a whole is also a problem, with lamb meat not having the cherry red colour that the consumer associates with freshness.
- Generally only 50% of a loin chop consists of meat and price alone does not seem to be a very accurate indicator of how much meat the consumer will get, except for the more specialised Karoo and free range products, which have a much better meat to fat ratio.

Please contact the Primary Researcher if you need a copy of the comprehensive report of this project – Michelle Hope-Jones on hopejonesm@arc.agric.za

Animal Products, Cattle and Small Stock, Quality and Value-adding

2018, ARC, ARC-API, HopeJones

‹ Nutrient content of lamb and mutton offal

› Genetic study on wet carcass syndrome

DEADLINES for RESEARCHERS 2021

Proposals for 2021: TBC
Progress reports: 28 Jan 21
Final reports: 29 Jan 21 Final includes comprehensive report and popular article

COMMITEE MEETINGS for 2021

RMRDSA CSS Planning - TBC
Project Committee - TBC
Pork Planning - TBC

Calendar

< Apr 2021 >

Sun	Mon	Tue	Wed	Tur	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

PORK Priority Areas

Cattle & Small Stock Programmes

1 Sustainable natural resource utilisation

2 Improvement of Livestock production and forage

3 Management of agricultural risk to create a resilient Red Meat sector

4 Sustainable health and welfare for the Red Meat sector

5 Enhancement of production and processing of Animal Products

6 Consumer and market development of the Red Meat sector

7 Commercialisation of the emerging sector