The quality of South African lamb – carcass, nutritional and sensory attributes

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Abstract

The aim was to determine the quality of South African lamb. Cut composition of SA lamb carcasses with different fat scores was determined. Sixty four grain fed lambs were randomly divided into three slaughter groups. The carcass sides were subdivided into seven wholesale cuts and dissected into meat, bone and subcutaneous fat, to determine the physical composition per cut for the whole carcass. The subcutaneous carcass fat increased significantly as the fat class increased. The percentages of total fat in the carcass increased by 15.5 % in subcutaneous fat over the five fat classes. To determine and compare the raw and cooked nutrient composition, the shoulder, loin and leg cuts of A2 lamb carcasses were analysed for proximate composition, selected B vitamins and minerals. There was no significant difference in the iron and zinc values between the different cuts. Results showed differences in the B-vitamins among the different cuts, but these were not statistically significant. When compared to values currently in the MRC Food Composition Tables, South African lamb contains 40 % less total fat per 100 g edible portion. Quantitative descriptive sensory analyses were performed on the *M. longissimus lumborum* of lambs. Results showed that carcass fatness does not have a significant effect on the sensory qualities of lambs from the same age increased. Fatness did not improve lamb tenderness.

Introduction

Most developing countries face the consequences of both nutritional deficiencies and excesses and South Africa is no exception. Labadarios (2000) confirmed that a double burden of nutrition-related diseases is prevalent in many households and communities in Southern Africa, as both over- and undernutrition are experienced, due to rapid urbanization and acculturation. As the incidence of chronic diseases continues to increase, the consumer's interest in the positive role food can play in controlling these afflictions, is growing (Schönfeldt, 2005). Although, the South African consumers frequently eat meat as part of their daily diet (ACNielsen, 2001), the majority is concerned about the amount of fat and cholesterol food products contain, as well as the long term effect it has on their well-being. In 2003, the need for information on the quality of South African lamb and mutton to address consumer uncertainties was identified by the Red Meat Producers Organisation (RPO) as being of prime importance. In 2004, the study was undertaken by the Agricultural Research Council-Animal Nutrition and Animal Products Institute (ARC-ANPI). The aim was to determine the quality of South African lamb, in terms of the carcass, nutrient and sensory attributes.

Materials and Methods

The main characteristics used to classify beef, lamb (for this study), sheep and goat carcasses, in South Africa are the age of the animal and the fatness of the carcass. No actual age according to months can be given, as the age of these animals is determined by the number of permanent incisor teeth. The roller mark on a carcass includes the age class (AAA, ABA, BBB or CCC) and the fatness class (000 (no fat, less than 1.0% SCF), 111 (very lean, Not more than 5.6% SCF), 222 (lean, > 5.6, but not more than 8.6 % SCF), 333 (Medium, > 8.6, but not more than 11.6 % SCF), 444 (fat, > 11.6, but not more than 14.6 % SCF), 555 (Over fat, > 14.6, but not more than 17.6 % SCF) or 666 excessively fat, > 17.6 % SCF)) (National Department of Agriculture, 1990).

The lamb meat samples comprised of the most commonly consumed carcasses in South Africa (Van der Westhuizen, personal communication, 2003), namely the Dorper breed. Animals (n=66) from the five fat classes were selected from two abattoirs that slaughter carcasses for three production areas in South Africa (Karoo, Kalahari and Ermelo). Chilled carcass sides were subdivided into seven wholesale cuts and dissected into meat (muscle, intermuscular and intramuscular fat), bone and subcutaneous fat (SCF) in order to determine the physical composition per cut and for the whole carcass.

Table 1. Experimental design for evaluation of carcass composition and sensory qualities of South African lamb

Breed type	Dorper				
Number of animals in study	66				
Sex of animals	Wethers				
Starting weight (kg)	23 - 26				
Days on feed	90 – 120 days (4 - 6 months)				
Slaughter weight (kg)	30		36		42
Number of animals in slaughter group	20		24		20
Distribution of carcasses per fat class	1	2	3	4	5
n =	15	15	17	9	8
Sample – Carcass composition	Carcass (7 primal cuts)				
Sample – Sensory analysis	*M. longissimus lumborum* cut of the left sides				

Nutrient analysis

To prepare the composite samples of 18 animals for proximate and nutrient analyses, the lamb carcasses were sectioned down the vertebral column by band saw, chilled and subdivided into seven wholesale cuts (neck, shoulder and shin, thick rib, breast, leg and shin, flank and loin). The meat and fat, respectively, of all three replications for each raw cut, from the right sides, (n = 7 cuts) and three cooked cuts from the left sides, were combined and cubed, thoroughly mixed and then minced, first through a 5 mm plate and then through one with 3 mm diameter holes. Samples of 300 g meat and separable fat were homogenized with an Ultra Turrax T25 homogenizer after mincing and put into aluminium foil trays covered with a vacuum bag prior to the meat from being freeze-dried and sent of to the ARC's Analytical Laboratory at Irene for proximate analysis (macronutrients analysed).

Table 2. Experimental design for nutrient analysis of South African (A2 Class)

18 A - age class, fat class 2 lamb carcasses – wethers					
9 Dorper			9 Mutton Merino		
Ermelo		Kalahari		Karoo	
3 Dorper & 3 Mutton Merino		3 Dorper & 3 Mutton Merino		3 Dorper & 3 Mutton Merino	
6 Right sides Raw	6 Left sides Cooked	6 Right sides Raw	6 Left sides Cooked	6 Right sides Raw	6 Left sides Cooked
Composite sample	Composite sample	Composite sample	Composite sample	Composite sample	Composite sample
Macronutrient analysis on meat & fat of 7 cuts • Micronutrient analysis on meat, & fat of 3 cuts	• Macro- & micro nutrient analysis on meat & fat of 3 cuts	• Macronutrient analysis on meat & fat of 7 cuts • Micronutrient analysis on meat, & fat of 3 cuts	Macro- & micro nutrient analysis on meat & fat of 3 cuts	• Macronutrient analysis on meat & fat of 7 cuts • Micronutrient analysis on meat, & fat of 3 cuts	Macro- & micro nutrient analysis on meat & fat of 3 cuts

Results and Discussions

The carcass composition in this study provides retailers with an insight into the variation in subcutaneous fat (SCF) of the different cuts of the carcass at different fat levels (fat scores). If the data is combined with efficient trimming skills of innovative retail operations, carcasses over a broad spectrum of fat levels could be processed into higher-value cuts that are more acceptable and attractive to the consumer. Trimming of visible fat in some cuts can result in less fat (10 g) per 100 g meat and can then be included in low fat diets.

Lamb (A2) is nutrient dense and is therefore an excellent source of nutrients [(protein (25.1g/100g), zinc (1.72 mg/100g), iron (0.63 mg/100g), magnesium (21.7 mg/100g) and the B-group vitamins, (niacin (B3) 1.42 mg/100g)] that are required for good health. Meat from the A2 lamb (± 7 % SCF) makes a valuable contribution to the RDA for males, aged 25 – 50 years. Results from the study showed that a 100 g portion of cooked shoulder provides 85 mg cholesterol and (a 100 g portion of) the cooked loin cut, 86 mg

and the leg cut 91.7 mg. Therefore it can be recommended that a person can eat a 100 g of A2 lamb in moderation as part of a healthy diet programme.

Focusing on the sensory attributes, meat is a favourite food in South Africa, therefore taste, aroma and texture are important sensory characteristics that contribute to the palatability of lamb (meat). However, there are numerous factors that may affect the quality, texture and flavour of lamb and sheep meat, such as age, fat class, breed, nutrition and sex. From this study it seemed as if differences were smaller because only one age group was investigated. With the exception of juiciness, the results in this study showed that, contrary to expectations carcass fatness (in the same age over five fat classes), as portrayed in the SA Classification system, does not have a significant effect on the sensory qualities of *M. longissimus lumborum* (loin) from lambs of the same age. The study found that meat cuts within the same age (A age class, fat class 2) do not differ significantly from each other in tenderness. Meat from animals in the same age (A2) with increasing fat classes (up to 16 % SCF) is juicier, with a higher percentage total cooking loss.

Conclusion

It can be concluded that the consumer will still have a palatable and nutritious product if some of the excess fat is trimmed from certain cuts. This conclusion is based on the results of this study, and only measured o the A age animals.

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