Sensory Evaluation of Awassi and Najdi Lambs Meat

Osman, B. M.   and   Aldosari, M. N.

College of Agricultural and Food Sciences, King Faisal University
Al-Hassa , Kingdom of Saudi Arabia

Abstract :

Meat sensory evaluation (juiceness , tenderness , flavour and overall acceptability) from leg and loin cuts of Awassi and Najdi lambs was carried out in a complete randomized design with 2X2 factorial arrangements i.e four treatments . The overall acceptability score was significantly ($P < 0.05$) higher in meat of Awassi lambs as compared to the Najdi breed. Moreover, tenderness was in favour for the Awassi groups. The loin cut eating quality attributes of the two breeds significantly excelled ($P < 0.05$) the leg cut . Consistently the shear force measurements were significantly higher in the leg cut compared to the loin. It is concluded that within the sampling limitation of this study the sensory assessment was in favour of the Awassi lambs . Overall balanced assessment necessitates further experimentation on these genetic resources within the context of sheep production and marketing systems in Saudi Arabia.

Key words: Sensory Evaluation Awassi Najdi lambs

Introduction:

Saudi Arabia is one of the middle east highest consumers of meat products. (El gasim and Ahmed 2002). Access to high quality red meat is of central importance to the consumers and producers. Changes in lifestyle of Saudi consumers, and concerns in the community over health issues have greatest impact in the sheep meat industry. As consumers turn to alternative protein sources such as chicken research must identify the characteristics most important to consumers when purchasing meat. These include good reliable quality, freshness, tenderness, flavour, taste , low fat and health benefits. In developed countries lambs rated lower than expected on tenderness, juiciness, flavour, health benefits, good reliable quality and value for money   (FAO 2001) . The factors tenderness , juiciness and flavour relate to the eating quality of the meat and it has been shown that repeat purchases of a meat cut are overwhelmingly influenced by previous experience of the eating quality of the meat (Lawrie 1998).

Meat eating quality can be defined in terms of the sensory attributes, tenderness, juiciness, and flavour (Lawrie, 1998). Tenderness and juiciness are the two sensory components of the perceived texture of lamb, while the flavour

of cooked lamb is considered to be it's most distinctive palatability characteristic (Stone et al. 1993). Flavour, juiciness and tenderness are complex multidimensional sensory characteristics, which cannot be readily measured by the use of objective test methods. Therefore, sensory evaluation plays a primary role in the quantification of meat quality characteristics. There are two types of sensory evaluation panel available; the consumer panel and the trained panel. When hedonic information is sought a consumer panel is used, and when analytical information is sought a trained panel and analytical testing is utilized. Hedonic tests are those that quantify degree of liking, and analytical tests indicate if a difference exists between two samples . The most common method uses a trained panel to rate variations in sensory characteristics of interest in relation to previously set anchor values. Panelists should be able to discriminate between a series of samples that exhibit a comprehensive range of differences (Stone and Sidel 1993). A panel trained in descriptive attribute sensory evaluation can be a tool used to increase market competitiveness. Meat sensory evaluation panelists trained in descriptive attribute techniques, terminology and sensory standards for evaluation of meat are not existing in Saudi Arabia. Therefore, the development of a lamb sensory evaluation panel is required particularly for breed comparison in meat eating quality. In this context, it was attempted to compare the Awassi and Najdi meat sensory characteristics using a panel semi-trained in sensory evaluation of lamb.

Material and Methods

Individuals from within the community were screened for discriminatory ability in eating quality characteristics of lamb using sequential triangle testing (Stone and Sidel 1993). Ten individuals were identified as possessing good discriminatory skills. Training was carried to familiarize these ten individuals with test procedures; and improve each individual's ability to recognize and quantify sensory attributes; thus permitting precise and consistent sensory judgements. On completion of training a series of evaluation panels were run. This involved repeated measurements of the same sample over time. The four treatments utilized in evaluation were; Awassi Lambs leg cut , Awassi Lambs loin cut , Najdi Lambs leg cut and Najdi Lambs loin cut. Eight male lambs, 9- 12 months old, average 20 kg. carcass weight are selected for the sensory evaluation. All the lambs are managed similarly and fed indoors on Rhodes, berseem and compound feed. The ingredients were approximately 60% barley, 25 % Soya bean meal and proprietary minerals and vitamins. Sensory evaluation was carried out according to Elgasim et al. (1981) procedure with

some modifications. At 5 days postmortem, 3 steaks (each 1 inch thick) were removed from the leg and loin joints of each of the 4 animals/breed, wrapped in plastic coated freezer paper and frozen at -18°C until used after one week. The steaks were cooked on a broiler (Elet Trodomestici, LA. Germana, Italy) to an internal temperature of 71°C monitored with thermocouples (Cole – Parmer Int. U.S.A.) For sensory evaluation, each steak was cut into six serving portions (1.5 cm cubes) . Thorough mixing of the meat cubes of each sample ensured that variations in meat characteristics were randomized across all panelists.   The steakslet were served within 10 min after cooking to 10 semi-trained panelists. Four test samples were presented to each panelist in each panel with 2 minutes elapsing between each test to reduce sensory fatigue and halo effects. Each test sample consisted of two cubes of meat. The panelists were instructed to taste the samples from left to right. Randomization of presentation order was used to ensure that each panelist evaluated every sample during the course of the session but no two panelists evaluated the same sample at the same time. All panelists received a ballot sheet numbered with the session code and a test number. Panelists evaluated tenderness, flavor, juiceness and overall acceptability using a 5-point hedonic scale (1 = the characteristic is least acceptable; 5 = characteristic is highly acceptable). After the test series was completed each sheet was decoded from a master sheet to determine which sample the individual panelist had evaluated in each test. The results were entered into the database for the individual samples. Panel evaluation was spread over one session. A series of test were also run to compare the shear force value of samples with the rating of tenderness given by the panel for the same sample.   After the samples were cooled to room temperature , the shear force value measurements were measured. Rectangular pieces of 1.25 X 0.80 cm with their axis parallel to the fiber, were removed and sheared in a Warner – Bratzler shear force device. Results were expressed in kg/cm^2 .

Statistical Analysis

Categorical model was fitted to the data and method of contrasts were used to determine if a significant difference existed between the treatments (and their interactions) investigated in the sensory evaluation tests using MLM option in SAS 8.02 (2001) . The evaluation data consists of two repeat evaluations of the same sample in all cases. The paired T test was used to analyze the data, with four treatments (sample types) and two observations per treatment per panelist for the session. This allows significant differences over

repeat evaluations to be identified. The linear correlation value between the shear force value and the panel's measure of tenderness was determined.

Results and Discussion

Examination of evaluation results showed that, overall, there was a consistency for the evaluation of tenderness as measured by the shear force and rated by panlists. The comparison of the panel's results to the shear force value taken on the same sample showed a negative correlation, such that as shear force increases, the panel rating of tenderness decreases. This indicates that the panel was an accurate instrument for the measurement of sensory tenderness and they can reliably quantify tenderness in lamb.

Analysis of variance in various sensory parameters (appendix tables 1-2) and comparison of mean tenderness ,flavor and juiceness scores of cooked meat from Awassi and Najdi sheep (table 1) revealed significant differences ($P < 0.05$) between the two cuts across both breeds .

Table (1)
Mean ($\pm$ SD) tenderness, flavor, juiceness and overall acceptability scores of Awassi and Najdi lambs meat

Attributes	Breeds			
	Awassi		Najdi	
	Cuts			
	leg	loin	leg	loin
Tenderness	3.40 $\pm$ 0.74c	3.80 $\pm$ 0.79a	3.15 $\pm$ 0.76c	3.57 $\pm$ 0.74ba
Flavor	3.55 $\pm$ 0.81ba	3.82 $\pm$ 0.78a	3.22 $\pm$ 0.76b	3.42 $\pm$ 0.81b
Juiceness	3.47 $\pm$ 0.84b	3.87 $\pm$ 0.68a	2.90 $\pm$ 0.95c	3.60 $\pm$ 0.63a
Overall acceptability	3.50 $\pm$ 0.90b	3.95 $\pm$ 0.74a	3.30 $\pm$ 0.88a	3.57 $\pm$ 0.71b

Means within a row bearing different letters are significantly different ($P < 0.05$)

The overall acceptability score was significantly ($P < 0.05$) higher in meat of Awassi sheep as compared to the Najdi breed. This is could be partly explained by the relatively favourable tenderness , flavour and juiceness scores in this group of animals (table 2)

Table (2)

Overall breed and cut mean (+SD) tenderness,
flavor, juiceness and acceptability scores of Najdi and Awassi lambs meat

Attributes	Cut		Breed	
	leg	loin	Awassi	Najdi
Tenderness	$3.27 \pm 0.76b$	$3.68 \pm 0.77a$	$3.60 \pm 0.78a$	$3.36 \pm 0.78a$
Flavor	$3.38 \pm 0.80a$	$3.62 \pm 0.81a$	$3.68 \pm 0.80a$	$3.32 \pm 0.79b$
Juiceness	$3.18 \pm 0.94b$	$3.73 \pm 0.67a$	$3.67 \pm 0.79a$	$3.25 \pm 0.87b$
Overall acceptability	$3.40 \pm 0.89b$	$3.76 \pm 0.75a$	$3.72 \pm 0.85a$	$3.43 \pm 0.80b$

Means within a row bearing different letters are significantly different $(P < 0.05)$

Consistently the shear force measurements were significantly higher (table 3) in the leg cut compared to the loin (i.e. the breed x cut interaction is non-significant) . Moreover, there was a higher tenderness in the Awassi groups compared to the Najdi (tables 3& 4).

Table (3)

Mean$(\pm SE)$ Tenderness of muscle in the leg and
loin cuts of Awassi and Najdi breeds

Breeds					
Awassi			Najdi		
Cuts					
Leg	loin	sig	leg	loin	sig
$11.62 \pm 1.60a$ (4)	$7.68 \pm 1.55b$ (4)	*	$11.35 \pm 0.91a$ (4)	$8.81 \pm 1.81b$ (4)	*

Means within a row bearing different letters are significantly different $(P < 0.05)$
* $P < 0.05$

Table (4)
Mean($\pm$ SE) Overall breed and cut
effect on tenderness

Breeds			Cuts		
Awassi	**Najdi**	**Sig**	**leg**	**loin**	**Sig**
9.65 $\pm$ 2.56a	10.08 $\pm$ 1.90a	NS	11.48 $\pm$ 1.21a	8.25 $\pm$ 1.67b	*

* P < 0.05   NS: Not significant (P > 0.05)

The ether extract (%) in the muscle of Awassi lambs (3.15 $\pm$ 0.41) is also higher than the Najdi lambs (2.76 $\pm$ 0.23) but not significant (P < 0.05). The chemical fat is believed to be major factor in eating quality of cooked meat (Gaili et al ; 1992) .

The sensory assessment was in favour of the Awassi lambs meat as compared to the Najdi. This is in contrast with the general belief that meat from Najdi sheep is of superior eating qualities than other local sheep breeds . The result of Gaili et al. (1992) who conducted consumer palatability studies on cooked meat from Najdi and Awassi sheep revealed non- significant breed effect on any of the paramters studied (tenderness, flavour , juiceness and acceptibility). Therefore, further research is needed to clarify these conflicting views. The evaluation process has established that the panelists can reliably quantify tenderness in lamb. Further training of panelists in juiciness and flavour evaluation is required with exposure to the full range of variables, to ensure complete reliability in evaluation of these attributes. The panel has been working with researchers in the university and it is available to other Saudi researchers and the meat industry to evaluate the impact of production and processing systems on eating quality. Looking to the future, consideration must be given to establishment of an ongoing recruitment and training program for the panel to remain viable. As attrition of the panel will occur as individual's circumstances change and they find themselves unable to continue as sensory panelists, a reserve of potential panelists and a continuous training program should be developed to ensure that this tool remains available to the sheep meat industry in the future. To improve the evaluation process it is necessary to investigate the consistency of the panelists in their evaluation within and between panels as well as between sessions.

Conclusions :

Within the sampling limitation of this study the sensory assessment was in favour of the Awassi lambs and loin cut as compared to the Najdi and leg cut. Development of a lamb sensory evaluation panel trained in descriptive sensory meat attributes is required to evaluate further research into production and processing aspects in terms of their impact on lamb eating quality and market competitiveness. Continued use and support of the panel by the sheep meat industry and researchers is required .

References :

1. Gaili, E.S.E. , El-Tom, Ali, K. El-Noaim, A. A. and Mafizud Islam, A. A. (1992). In: A comparative study of meat production from the indigenous sheep of Saudi Arabia. Publisher - King Abdulaziz City for Science and Technology - Riyadh No. 54.

2. Elgasim , E. A. and Ahmed , A. H. (2002). Development of the red and white meats industry in the Kingdom of Saudi Arabia in the last two decades. Proceedings of Agricultural and Water Resources Development Symposium in the Reign of the Two Holy Moseques King Fahad Bin Abdlul Aziz . King Faisal University , College of Agricultural and food Sciences Al Hussa Kingdom of Saudi Arabia , p. 343 – 355.

3. Elgasim , E. A. Kennick, W. S. H., Mc. Gill, L. A. Rock, D. F. and Soeldner, A. (1981) . Effect of electrical stimulation and delayed chilling of beef carcass and meat characteristics. J. of Food Sci. 46: 340 – 349.

4. FAO Statstics 2001. Food Balance Sheets . Rome Italy.

5. Lawrie, R. A. (1998) Meat science, Woodhead Publishing Ltd, Cambridge.

6. SAS. (2001). SAS User's Guide: Statistics. SAS Ins, Inc., Cary. NC.

7. Stone, H. and Sidel, J. L. (1993) Sensory evaluation practices, Academic Press Inc., San Diego.

Appendices

Table (1)
analysis of variance for meat quality parameters

Source	DF	Chi-Square			
		tenderness	flavour	juiceness	Overall acceptability
intercept	1	1939.30 (0.0001)	187.48 (0.0001)	3209.57 (0.0001)	87.97 (0.0001)
breed	1	1.28 (0.2586)	27.63 (0.0001)	15.68 (0.0001)	18.14 (0.0004)
cut	1	1.40 (0.2368)	13.15 (0.0043)	12.60 (0.0004)	51.68 (0.0001)
breed*cut	1	0.28 (0.5939)	1.04 (0.7909)	1.33 (0.2490)	10.21 (0.0169)

Note: Pr > Chi Square in parenthesis

Table (2)
Analysis of breed and cut contrasts

Contrast	DF	Chi-Square			
		tenderness	flavour	juiceness	Overall acceptability
Awassi vs. Najdi	1	0.21 (0.6445)	12.42 (0.0061)	3.45 (0.0634)	5.42 (0.1435)
leg vs. lion	1	0.18 (0.6682)	7.77 (0.0510)	11.77 (0.0006)	42.03 (0.0001)

Note: Pr > Chi Square in parenthesis

التقييم الحسي للحوم حملان العواسي والنجدي

بابكر مالك عثمان و محمد بن ناصر الدوسري

كلية العلوم الزراعية والأغذية ، جامعة الملك فيصل

الأحساء ، المملكة العربية السعودية

ملخص :

تم إجراء التقييم الحسي (العصيرية ، الطراوة، النكهة والتقبل العام) للحوم قطعيتى الفخذ والقطن من حملان سلالتي العواسي والنجدي وذلك من خلال التصميم الاحصائي تام العشوائية ذو الترتيب العاملي ٢ X ٢ ليشمل أربعة معاملات. تفوقت سلالة العواسي على النجدي في صفة التقبل العام معنويا ($P < 0.05$) . تفوقت قطعيات القطن للسلالتين على قطعيات الفخذ في كل صفات التذوق الحسي المدروسة . القوة التمزيقية لقطعية الفخذ كانت على الدوام أعلى من قطعية القطن. في كل الأحوال لم يكن التداخل بين العوامل قيد الدراسة (السلالة والقطعية اللحمية) دالا إحصائيا. يستنتج من هذا وفى حدود حجم التجربة انه بالإمكان الحصول على مواصفات حسية مقبولة من لحوم سلالتي العواسي والنجدي إلا أن ميزان التقييم الحسي للحوم يميل لصالح سلالة العواسي. من الدراسة يتبين هنالك حوجة للمزيد من الدراسات المقارنة لهذه السلالات لتقييمها من واقع نظم إنتاج وتسويق الأغنام المتاحة في المملكة العربية السعودية .