

## SENSORY QUALITY OF LOIN AND LEG LAMB CHOPS PACKAGED IN MODIFIED ATMOSPHERE

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### Background

Modified Atmosphere Packaging (MAP) is now a common means of retail sale display in most markets. MAP is used to maintain the sensory characteristics of fresh meat and extend its shelf life. For red meat, especially beef, the recommended atmosphere is 70% O<sub>2</sub>, 20% CO<sub>2</sub> and 10% N<sub>2</sub> (Renere, 1986). Atmospheres with 100% CO<sub>2</sub>; 50% O<sub>2</sub> and 50% CO<sub>2</sub>; 80% O<sub>2</sub> and 20% CO<sub>2</sub> (Sheridan J.J. 1997, Doherty A.M. 1996) have been used for lamb meat but only a few researches have analysed the effect of MAP on lamb sensory characteristics.

### Objective

The aim of this study was to investigate the effect of the packaging in an atmosphere with 60% O<sub>2</sub>, 30% CO<sub>2</sub> and 10% N<sub>2</sub> on the sensory attributes of leg and loin lamb chops using panel and consumer test.

### Methods

Sixteen male lambs from the Spanish breed Rasa Aragonesa were used. All the carcasses were considered "Ternasco de Aragón" (PGI). Weight ranged from 10-11 kg. Carcasses were cooled commercially and sampled 24 hours after slaughtering. Both loins and legs were excised from each carcass and immediately chopped. The meat was packaged with an ULMA Termosealed (SMART) with polystyrene trays (LINPAC T 15-55 Linfresh) and film (LINPAC Lintop THB 65) in an atmosphere with 60% O<sub>2</sub>, 30% CO<sub>2</sub> and 10% N<sub>2</sub>. Chops from 8 animals were randomly aged for 1 day and MAP packaged and stored during 5, 10 and 15 days. Trays were stored at 2°C +/- 1°C. The control involved 8 carcasses with 3 days of ageing, which is the traditional practise in the Spanish market. All samples were vacuum packed, frozen and stored at -20°C until required for assessment. Samples were thawed in tap water until 15-17°C. Bone was excised, if required, from the samples before cooking. Cooking temperature was 200°C (grill), until the internal temperature reached was 70°C. Samples were served hot.

Sensory traits were evaluated by a trained panel (n=72 judgements by treatment) using the loin chops (*longissimus lumborum*). The controls plus the chops aged at four different times were evaluated on each plate and the panel was asked to score different attributes (Table 1). For the consumer test (n=128), samples from each treatment were presented in the same way as the trained panel using *semimembranosus*, *semitendinosus*, *gluteus biceps* muscles from leg chops (See Table 2 for attributes).

The statistical analysis was performed with SPSS package for Windows 98. Differences between treatments were analysed by ANOVA and Duncan's multiple range test.

### Results and discussions

For the sensory panel, the control group with 3 days of ageing and the treatment with 1 day of ageing (chops) had a higher lamb intensity odour and flavour (Table 1). These two attributes were less intense when the meat was left for longer periods in the MAP due to the presence of strange flavours and odours. The results agree with Sheridan *et al.*, (1997); who described off-odours after 5 days of MAP in lamb meat. However the opposite occurred for lipid flavour, which became more intense as ageing increased. This could be explained by a direct effect of this atmosphere but the reasons for this are unclear. There were no significant differences in tenderness between the group with 1 day of ageing and the treatments with an additional 5, 10 and 15 days of MAP. Thus, the atmosphere used seemed to have some influence on the mechanisms involved in meat ageing. The control group with 3 days of ageing was the most tender. The control group had more flavour quality and overall acceptability and the rest of the treatments had lower scores according to the days of MAP packaging.

Consumers did not find significant differences in tenderness between the treatments, in disagreement with the results found by the panel when control and MAP meat were compared (Table 2). But flavour quality decreased with the time of MAP packaging, as in the taste panel. The control group and the group with 1 day ageing had higher overall acceptability, especially for ageing times longer than 5 days of MAP packaging.

### Conclusions

A modified atmosphere with 60% O<sub>2</sub>, 30% CO<sub>2</sub> and 10% N<sub>2</sub> could affect lamb meat ageing because no differences were found in tenderness between 1 day carcass ageing (without MAP) and with additional 5 or 15 days of MAP packaging. On the other hand, flavour and odour could be strongly affected by this MAP. With this atmosphere we found a notable loss of sensory quality at 5 days. So, probably not more than 4 days of shelf life should be recommended for packaging lamb chops with this MAP.

### References

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Table 1. Effect of time (5, 10 and 15 days) of MAP packaging (60% O<sub>2</sub>, 30% CO<sub>2</sub> and 10% N<sub>2</sub>) on sensory attributes (taste panel) of lamb loin chops. Means and (standard deviation).

TREATMENT	3 days (control)	1 day	1 day +5 MAP	1 day +10 MAP	1 day +15 MAP	F
Lamb odour intensity* (1-100)	49.13 d (15.67)	47.61 c d (17.14)	40.84 b c (21.05)	35.50 a b (22.00)	29.79 a (24.13)	9.96 **
Tenderness* (1-100)	65.18 b (16.87)	50.52 a (15.63)	49.42 a (18.23)	53.97 a (18.33)	53.00 a (17.42)	8.17 **
Juiciness* (1-100)	59.77 b (16.75)	44.97 a (15.29)	42.64 a (18.54)	43.36 a (17.33)	40.52 a (15.90)	12.86 **
Lamb flavour intensity* (1-100)	56.98 c (15.21)	53.66 c (16.75)	38.50 b (17.79)	32.77 b (18.43)	24.67a (18.02)	38.75 **
Fat flavour intensity* (1-100)	43.48 a (17.28)	47.27a (18.88)	58.68 b (21.99)	57.51 b (23.80)	58.27b (24.68)	6.70 **
Liver flavour intensity* (1-100)	26.37 a (16.06)	26.39 a (14.73)	23.88 a (18.67)	21.54 a (17.19)	19.91 a (17.62)	n.s.
Flavour quality* (1-100)	52.77 d (15.32)	43.29 c (17.70)	29.08 b (17.96)	22.84 a (16.03)	18.45 a (16.23)	45.20 **
Overall satisfaction* (1-100)	54.35 d (15.07)	45.18 c (18.31)	29.23 b (19.23)	25.20 a b (16.65)	19.69 a (17.66)	42.23 **

Means in the same row with different letters (a, b, c and d) are significantly different.

\*\* p ≤ 0.01.

\* Higher values means superior intensity or high acceptability in each parameter

Table 2. Effect of time (5, 10 and 15 days) of Modified Atmosphere Packaging (60% O<sub>2</sub>, 30% CO<sub>2</sub> and 10% N<sub>2</sub>) on consumer test of lamb leg chops. Means and (standard deviation).

TREATMENT	3 days (control)	1 day	1 day +5 MAP	1 day +10 MAP	1 day +15 MAP	F
Tenderness* (1-100)	57.89 a (20.76)	58.13 a (26.14)	58.98 a (24.71)	59.84 a (21.70)	59.30 a (21.78)	NS
Taste quality* (1-100)	61.02 c (18.09)	63.13 c (20.80)	51.88 b (21.47)	48.05 b (20.00)	39.77 a (21.42)	28.26 **
Overall satisfaction* (1-100)	59.77 c (17.41)	61.95 c (21.92)	53.28 b (22.52)	50.08 b (19.74)	43.20 a (22.34)	16.76 **

Means in the same row with different letters (a, b, c y d) are significantly different

\*\* p ≤ 0.01.

\* Higher means indicate superior intensity or high acceptability in each parameter