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Evaluation of physico-chemical parameters of aging lamb meats from "Castilla León" (#274)

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Introduction

The sustainability of sheep meat production systems relies upon their ecological footprint, animal welfare aspects and nutritional quality of lamb. The promotion of changes in farm management could result in useful outcomes to understand the potential barriers that limit the development of the sector and the promising opportunities to provide a future solid market. In order to explore the opportunities generated from this approach, the preservation of meat quality is necessary (Montossi et al., 2013). Shelf life and quality of fresh meat are influenced by initial quality, package parameters, and storage conditions (Zhao, Wells, & McMillin, 1994). Likewise, parameters such as colour, microbial growth, lipid oxidation, appearance, flavor and texture (Gómez & Lorenzo, 2012) determine shelf life and consumer acceptance of fresh meat. These parameters are influenced by factors like aging time and breed. The present study aimed to evaluate the impact of aging time (3, 9, and 15 days at 4 °C) on pH, color, texture, and lipid oxidation of Castellana and INRA401 lamb meat.

Methods

All handling practices followed the recommendations of the Directive 2010/63/EU of the European Parliament and the Council of the European Union (2010). Five Castellana and five INRA401 male lambs (already weaned, 6 to 8 weeks old) were used. Animals from each breed were housed together with straw bedding and had free access to commercial concentrate (894 g DM/ kg fresh matter, 145 g neutral detergent fibre/kg DM, 58 g acid detergent fibre/kg DM, 190 g CP/kg DM and 75 g ash/kg DM), cereal straw (917 g DM/kg fresh matter, 785 g neutral detergent fibre/kg DM, 506 g acid detergent fibre/kg DM, 40 g CP/kg DM and 78 g ash/kg DM) and fresh water during the whole experiment. At 4 months old, they were transported to a commercial abattoir (1.5 h transport), stunned, slaughtered by exsanguination from the jugular vein, eviscerated, and skinned to obtain the carcass (chilled at 4 °C for 24 h). Lamb meat samples (*longissimus thoracis*) were collected and the effect of aging (4 °C) on pH, color (lightness (L*), redness (a*) and yellowness (b*)), TBARs and texture were evaluated on days 3, 9 and 15 after slaughter according to Lorenzo et al. (2014). Data were analyzed using a two-way ANOVA procedure followed by a Duncan's test. The differences were considered to be significant at $P<0.05$.

Results

Both pH and color were influenced by aging time (Table 1). Regarding the breed effect, significant differences were observed on pH (days 3 and 15), L* and b* values. In the case of a* value, the significant difference between breeds was observed only on day 9. The same gradual increase of pH during aging period was reported by Zhang et al. (2013) for Tan male sheep meat during aging (from 5.69 to 5.75 on day 2 and 8, respectively). This effect could be attributed to proteolysis. Regarding color, other authors observed that L* and b* values were not influenced after 7 days of aging on Awassi ram lamb meat (Abdullah & Qudsieh, 2009). The increase on a* value during aging was reported by other authors on ovine meat (Abdullah & Qudsieh, 2009; Abuelfatah et al., 2016). Regarding texture, firmness gradually decreased during aging time for both breeds but total work and shear force of Castellana samples reduced over time (Table 1). The breed effect was observed for all texture parameters on 3 and 9 days of aging wherein Castellana meat displayed higher values than INRA401 breed meat. Similar decreasing trends in the texture of ovine meat during aging were reported by Abuelfatah et al. (2016) for crossed Boer bucks' meat but in a lower range of values (from 1.25 to 1.12 on days 1 and 7, respectively). Finally, TBARs values (Figure 1) increased progressively and significantly ($P<0.001$) during aging time but non-significant differences were observed between breeds. This increasing trend on TBARS values during aging was reported by other authors with ovine meat during 7 days of aging (Abuelfatah et al., 2016). It is worth mentioning that TBARS values for both breeds were below the threshold (2 mg MDA/kg meat) identified by Campo et al. (2006) for sensorial perception of rancidity.

Conclusion

Most of the characteristics of the meat obtained from both breeds were influenced by aging time. The lower texture values observed in meat from INRA401 lambs suggest that this breed could be explored for commercialization purposes after 9 days of aging.

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Notes

Figure 1. Lipid stability of Castellana and INRA401 lamb meats during aging at 4 °C. Mean values in the same breed not followed by a same letter differ significantly (P<0.05).

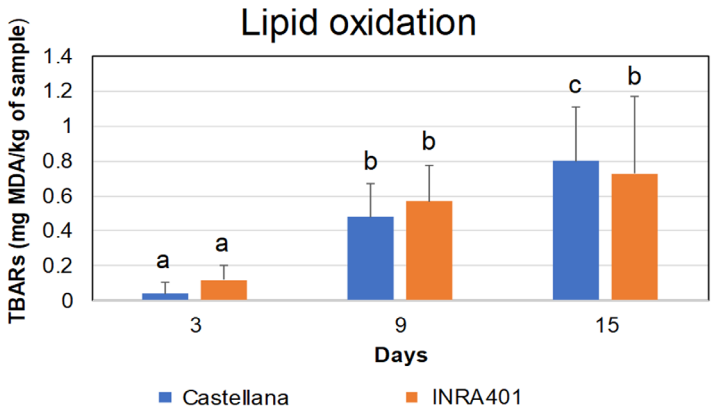

Figure 1

Table 1: pH, color, and texture of Castellana and INRA401 lamb meats during aging at 4 °C

	Aging time			SEM	*Sig.*
	3 Days	9 Days	15 Days		
pH					
Castellana	5.44^{a}	5.77^{b}	5.74^{b}	0.04	***
INRA401	5.60	5.63	5.61	0.02	*ns*
Sig.	**	*ns*	***		
Color parameters					
L*					
Castellana	40.46^{a}	43.44^{b}	41.60^{a}	0.37	**
INRA401	43.05^{a}	45.25^{b}	45.88^{b}	0.30	***
Sig.	**	*	***		
a*					
Castellana	9.81^{a}	10.95^{b}	11.75^{b}	0.25	**
INRA401	10.24^{a}	13.38^{c}	12.26^{b}	0.27	***
Sig.	*ns*	***	*ns*		
b*					
Castellana	10.13^{a}	11.78^{b}	12.18^{b}	0.24	***
INRA401	11.32^{a}	14.97^{b}	14.23^{b}	0.30	***
Sig.	*	***	***		
Firmness (kg/s.g)					
Castellana	1.04^{c}	0.80^{b}	0.64^{a}	0.03	***
INRA401	0.66^{b}	0.49^{a}	0.56^{ab}	0.03	*
Sig.	***	***	*ns*		
Total work (Kg.mm)					
Castellana	18.00^{b}	13.31^{a}	11.85^{a}	0.67	***
INRA401	10.61	7.54	8.37	0.60	*ns*
Sig.	***	***	**		
Shear force (Kg/cm²)					
Castellana	4.01^{c}	2.93^{b}	2.27^{a}	0.15	***
INRA401	2.49	1.62	2.09	0.17	*ns*
Sig.	***	***	*ns*		

Mean values in the same row (corresponding to the same breed) not followed by the same superscript letter differ significantly (P<0.05).
SEM: standard error of mean
Sig.: Significance; ns: not significant; *(P< 0.05); **(P< 0.01); ***(P< 0.001)

Table 1

Notes

References

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