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Fatty acid profile of lamb meat from two portuguese autochthonous breeds (#268)

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Notes

Introduction

In Portugal, sheep and goat meat production accounts for 2.8% of the total meat production in the country; and it is capable of supplying approximately 82% of the domestic demand (INE, 2015). Churra-Galega-Bragançana (CGB) and Bordaleira-entre-Douro-e-Minho (BEDM) are two native breeds of the north of Portugal, classified as endangered lamb breeds. These breeds are exploited for meat production, the former in the Atlantic bio-region and the latter in the Mediterranean area. Production factors, such as breed, have a great influence on nutritional aspects related with the content and quality of fat and fatty acid profile (Frank et al., 2016), which are considered important quality indicators that have a great influence on consumer acceptability (Andersen et al., 2005), especially nowadays as consumers have become increasingly concerned about health and the relationship between meat consumption and saturated fatty acids (Leroy and De Smet, 2019). These autochthonous breeds constitute an important genetic heritage that must be preserved, so assessing their fatty acid profile will allow a correct characterization of these breeds and their products.

Methods

The study was carried out using fifteen lambs of each breed, BEDM and CGB, reared in a semi-intensive production system, and slaughtered at four months of age. The muscle *longissimus thoracis* was extracted from the left half of each carcass, between the sixth and the thirteenth rib. The fat extraction for the determination of fatty acid composition was performance following the method proposed by Bligh and Dyer (1959). The transesterification, identification and quantification of fatty acid methyl esters were performed using gas chromatography techniques according to the chromatographic conditions described by Domínguez et al. (2015). Results were expressed as percentage of total fatty acid methyl esters (FAMES). The effect of breed on fatty acids profile was determined using a one-way ANOVA with the IBM SPSS Statistics 21.0 software (IBM Corporation, Somers, NY, USA).

Results

The fatty acids identified from meat of CGB and BEDM breeds are shown in Table 1. The content of specific fatty acids is important to evaluate the meat nutritional quality from these breeds (Polidori et al., 2011). In this study, significant differences ($P<0.05$) were observed in the fatty acid profiles between breeds. This outcome is in accordance with those found by Costa et al. (2015). In this way, meat from CGB showed the prevalence of MUFA (44%) followed by SFA (41%), while in BEDM samples the predominant fatty acids were SFA (42%) followed by MUFA (31%). As expected, the contents of PUFA in lamb meat were the lowest for both breeds, confirming previous results obtained by Díaz et al. (2005) for other lambs produced in Europe. The profile found in BEDM samples was similar to those reported by other authors in Fabrianese lambs slaughtered at 5 months (Polidori et al., 2017) and lower that those obtained by Quiñones et al. (2018) in Araucano creole lambs. Breed did not have any effect ($P>0.05$) on the total SFA content. However, differences ($P<0.05$) were found in individual fatty acids, especially noticeable in the predominant SFA (palmitic and stearic acids). Therefore, palmitic acid showed the highest levels in lamb meat from CGB breed (23.24 vs. 18.36% for CGB and BEDM breeds, respectively), while lamb meat from BEDM breed contained the highest amounts of stearic acid (11.63 vs. 15.18% for CGB and BEDM breed, respectively). Regarding MUFA, significant differences ($P<0.001$) were observed between breeds. This result was due to the highest MUFA values found in CGB samples. The most notable differences were observed in C18:1n-9 (37.01 vs. 27.3%, for CGB and BEDM breeds, respectively). Moreover, this fatty acid was the predominant one, representing 86.4% of total MUFA. As occurred in MUFA, PUFA contents were also influenced by breed ($P<0.001$). In this case, the meat samples from BEDM breed presented higher values of PUFA than those from CGB animals (27.54 *vs.* 14.90%, for BEDM and CGB breeds, respectively). These differences were especially notable due to the higher contents of n-3 PUFA (7.05 vs. 1.87%, for BEDM and CGB breeds, respectively). Finally, lower ratios n-6/n-3 were observed in lamb meat from BEDM breed (2.76 vs. 6.71, for BEDM and CGB breeds, respectively), with values that are within the recommendations for human diet (n-6/n-3<4; FAO, 2010). The ratio P/S showed higher values in lamb meat from BEDM breed (0.68); however, the ratio was lower than the recommended values (P/S=0.85; FAO, 2010).

Conclusion

The results of fatty acid profile covered an aspect of the nutritional quality of the intramuscular fat of lamb meat from BEDM and CGB breeds, especially from a human nutrition perspective. The values obtained for BEDM breed lamb meat were very close to the recommended values for human diet. This study was useful for the research community and final consumers who are increasingly demanding healthy and high-quality food products.

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Acknowledgements

Notes

Table 1. Fatty acid profile of lamb meat from two Portuguese autochthonous breeds: Churra-Galega-Bragançana (CGB) and Bordaleira-entre-Douro-e-Minho (BEDM) (g/100 g of total fatty acids).

	Breed		SEM	Sig.
	CGB	BEDM		
C14:0	3.49	2.42	0.20	**
C15:0	0.34	0.44	0.02	**
C16:0	23.24	18.36	0.64	***
C16:1*n-7*	1.88	0.97	0.10	***
C17:0	0.86	2.58	0.17	***
C17:1*n-7*	0.56	0.59	0.01	ns
C18:0	11.63	15.18	0.50	***
9t-C18:1	1.07	0.34	0.08	***
11t-C18:1	1.89	0.95	0.11	***
C18:1*n-9*	37.01	27.25	1.00	***
C18:1*n-7*	1.12	0.32	0.08	***
C18:2*n-6*	8.40	11.55	0.49	***
C18:3*n-3*	0.65	2.11	0.14	***
CLA	0.85	0.55	0.04	***
C22:0	0.24	1.02	0.09	***
C20:3*n-6*	0.29	0.55	0.04	***
C20:4*n-6*	3.73	7.22	0.48	***
C20:5*n-3*	0.28	1.88	0.17	***
C22:5*n-3*	0.70	2.32	0.18	***
C22:6*n-3*	0.24	0.74	0.06	***
SFA	41.17	41.68	0.59	ns
MUFA	43.93	30.78	1.31	***
PUFA	14.90	27.54	1.50	***
n-6	12.42	19.33	0.95	***
n-3	1.87	7.05	0.54	***
n-6/*n*-3	6.71	2.76	0.40	***
P/S	0.37	0.68	0.04	***

SEM: Standard error of the mean; Sig. Significance; ns: not significant; **: P<0.01; ***: P<0.001; SFA. Saturated fatty acids (C14:0+C15:0+C16:0+C17:0+C18:0+C22:0); MUFA. Monounsaturated fatty acids (C16:1*n-7*+C17:1*n-7*+*9t*-C18:1+*11t*-C18:1+C18:1*n-9*+C18:1*n-7*); PUFA. Polyunsaturated fatty acids (C18:2*n-6*+C18:3*n-3*+CLA+C20:3*n-6*+C20:4*n-6*+C20:5*n-3*+C22:5*n-3*+C22:6*n*-3).

Table 1

Notes