FATTY ACID COMPOSITION OF *M. LONGISSIMUS DORSI* IN PURE AND CROSSBRED LAMBS IN GRAZING SYSTEMS

Bianchi, G.; Garibotto, G. y Bentancur, O.
Universidad de la República. Facultad de Agronomía. Estación Experimental "Dr. Mario A. Cassinoni". Paysandú. 60000. URUGUAY.
E-mail: tano@fagro.edu.yu

Background

Crossbred lamb meat production had successfully worked in countries like Australia, New Zealand and United Kingdom, where high quality lamb meat production is efficiently developed. The amount of scientific literature produced in the last 40 years by those countries (Garibotto, 1997), was an important support for this goal. The information generated in Uruguay relative to crossbred lamb meat production was synthesized (Bianchi, 1997), and since 1996 the Agronomy Faculty with meat producers and processors are working in a crossbred lamb meat production Project; principal results were summarized by Bianchi *et al,* (1997).

As far as most consumers are concerned, meat should contain only a small amount of fat. The amount of these fat in the diet, and especially its content of saturated fatty acids, are considered major risk factors for coronary heart disease. However, there are not previous reports in Uruguay about the effects of genotype on fat content and fatty acid composition of lamb meat on grazing systems.

Objectives

The objective of the present work is to evaluate breed type effect on fatty acid composition of ***M. Longissimus** dorsi* in pure and crossbred lambs in grazing systems.

Methods

In 99 lamb carcasses coming from 7 trials made in Uruguay in 5 places during 3 years (Bianchi, 2001), the intramuscular fat content and fatty acid composition of *M. Longissimus dorsi* was determined. Lambs (females, entire, cryptorchid and castrated) were the offspring of 57 Corriedale (C), Australian Merino (MA), Romney Marsh (RM), Texel (TX), Hampshire Down (HD), Southdown (SD), Île de France (IF) and Suffolk (SF) rams with Corriedale, Australian Merino, Romney Marsh, Texel x Corriedale, Île de France x Corriedale and Milchschaf x Corriedale ewes, slaughtered with an average carcass weight of 16.3 ± 2.7 kg. Lipid were extracted with chloroform-methanol (Folch *et al.*, 1957). Fatty acid methyl esters were prepared and analyzed by gas chromatography (AOCS, 1986). Saturated, mono-unsaturated and ploy-unsaturated fatty acids percentages were calculated.

Place, lamb genotype nestled in place and lamb sex nestled in far, were studied by variance analysis with a fix model that included lamb age as covariable. Components of the variance were estimated using the GLM procedure of the statistical SAS version 6.12 (SAS, Institute Inc., 1998), using the sum of squares type III.

Results and discussions

Table 1 presents the effect of lamb genotype on lipid content and fatty acids composition of intramuscular fat of pure and crossbred lambs

A place effect was registered for all variables presented in Table 1. Different place includes different years, different lambing seasons, different animal managements (in places 1, 3, 4 and 7 lambs were weaned; instead, in places 2, 5 and 6, lambs remained with their mothers until slaughter) and different nutrition management (different pastures and stocking rates). Although all lambs grazed in pastures, each place had a different production system, that explain the differences registrated in Table 1. Sañudo *et al.* (2000), also reports an important effect of the production system on the amount and quality of intramuscular fat of Spanish and British lambs, with no breed effect. In present work lamb genotype was significant only for total saturated fatty acid percentage and, particularly for palmitic (16:0). However, independently of major effects evaluated, intamuscular fat values were low and composition of these fat seems to be not a problem for human health, due to favorable PUFA/SFA (>0.2) and MUFA/SFA (0.7-1.5) relations obtained in the different evaluated situations.

Conclusions

Results obtained in this preliminar work, suggests that Uruguayan lambs grazing on pastures had an acceptable and healthy meat, independently of the genotype considered.

Acknowledgements

This work is part of full time Program of Gianni Bianchi. We are grateful to the INIA-MGAP-BID for supporting part of this work.

References

American Oil Chemists Society. Official and tentative methods. Edited by R. C. Walker, AOCS, Champaign, IL, 1986.

Bianchi, G. 1997. Cruzamientos con Razas Carniceras y Desempeño Animal: Resultados de la Investigación Nacional. *In:* G. Bianchi (Ed.). Producción de Carne Ovina en base a Cruzamientos. Universidad de la República. Facultad de Agronomía. EEMAC. Paysandú. Uruguay. pp: 11-22.

Bianchi, G., Garibotto, G. y Oliveira, G. 1997. *In:* G. Bianchi (Ed.).Producción de Carne Ovina en base a Cruzamientos. Universidad de la República. Facultad de Agronomía. EEMAC. Paysandú. Uruguay. 63p.

Bianchi, G. 2001. Utilización de razas y cruzamientos para la producción de carne ovina en Uruguay. *In:* Curso Internacional en salud y producción ovina. Universidad Austral de Chile. Facultad de Ciencias Escuela de Graduados. Valdivia 17 y 18 de mayo 2001. Chile. pp: 53-69.Veterinarias.

Folch,J.; Lees,M. and Sanley,G.S.H. 1957. A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 226: 497-509.

Garibotto, G. 1997. III. Desempeño productivo y reproductivo de madres y corderos cruza: resultados de la investigación extranjera. *In:* G. Bianchi (Ed.). Producción de Carne Ovina en base a Cruzamientos. pp: 23-42.

SAS Institute Inc., SAS/STAT. User`s Guide, Versión 6.12. Carey, NC. 1998.

Sañudo, C.; Enser, M.E.; Campo, M.M.;Nute, G.R., María, G.; Sierra, I. and Wood., J.D. 2000. Fatty acid composition and sensory characteristics of lamb carcasses from Britain and Spain. Meat Science 54:339-346.

Table 1. Lipid content and fatty acid composition of intramuscular fat of M. Longissimus dorsi. Least squares means (adjusted by sex (place) and lamb age (place)) and standard error.

	Lipid (%)		SFA (%)		C14:0 (%)		C16:0 (%)		C18:0 (%)		MUFA (%)		PUFA (%)	
Place	*		***		***		***		***		***		***	
1	3.2 ± 0.24	ab	48.3± 1.02	a	4.8 ± 0.34	ab	25.6± 0.81	ab	15.8± 0.61	a	38.1 ±1.22	ab	8.5±0.65	d
2	3.2 ± 0.23	ab	37.7± 0.97	b	3.5 ± 0.32	b	22.7± 0.78	b	8.8± 0.59	c	39.3 ±1.17	ab	19.0±0.63	a
3	3.5 ± 0.26	a	37.9± 1.13	b	3.5 ± 0.37	b	20.3± 0.90	c	11.5± 0.68	b	41.4 ±1.36	ab	14.4±0.72	b
4	3.4 ± 0.23	ab	48.6± 0.97	a	4.6 ± 0.32	ab	26.8± 0.78	a	15.0± 0.59	a	39.3 ±1.17	ab	8.3±0.62	d
5	3.2 ± 0.29	b	43.4± 1.24	a	4.1 ± 0.42	b	22.4± 0.99	bc	13.3± 0.75	ab	43.0 ±1.49	a	6.9±0.79	d
6	3.2 ± 0.25	ab	46.7± 1.08	a	5.3 ± 0.36	a	24.1± 0.82	abc	14.2± 0.65	ab	35.6 ±1.29	bc	12.0±0.69	bc
7	2.1 ± 0.41	b	48.9± 1.76	a	5.1 ± 0.58	ab	25.2± 1.40	ab	15.5± 1.06	a	32.2 ±2.11	c	11.1±1.13	cd
Lamb genotype (place)	ns		+		ns		**		ns		ns		ns	
½ HD ½ MA (1)	2.87 ± 0.50		47.1 ± 2.13	ab	5.0 ± 0.70		24.0 ± 1.69	ab	16.1 ± 1.28		39.5 ± 2.55		8.9 ± 1.36	
½ SD ½ MA (1)	3.31 ± 0.50		48.7 ± 2.13	a	4.8 ± 0.70		26.2 ± 1.69	ab	15.0 ± 1.28		36.3 ± 2.56		9.1 ± 1.6	
½ IF ½ MA (1)	2.76 ± 0.42		48.8 ± 1.80	a	4.1 ± 0.59		25.2 ± 1.43	ab	17.3 ± 1.08		38.9 ± 2.16		7.3 ± 1.15	
MA (1)	4.02 ± 0.44		48.9 ± 1.90	a	5.3 ± 0.63		27.0 ± 1.51	a	14.5 ± 1.14		37.6 ± 2.28		8.5 ± 1.22	
½ TX ½ C (2)	3.60 ± 0.41		36.3 ± 1.73	cd	3.7 ± 0.57		21.9 ± 1.38	ab	8.3 ± 1.04		39.1 ± 2.08		19.6 ± 1.11	
½ HD ½ C (2)	3.10 ± 0.50		33.2 ± 2.13	d	3.0 ± 0.70		18.8 ± 1.70	bc	8.9 ± 1.28		41.2 ± 2.56		19.1 ± 1.37	
½ SD ½ C (2)	3.46 ± 0.50		42.4 ± 2.12	abcd	3.6 ± 0.70		27.2 ± 1.69	a	8.6 ± 1.28		37.1 ± 2.55		19.3 ± 1.36	
½ SF ½ C (2)	2.80 ± 0.41		38.8 ± 1.75	bcd	3.8 ± 0.58		22.9 ± 1.40	ab	9.3 ± 1.06		40.0 ± 2.11		18.1 ± 1.13	
½ TX ½ C (3)	4.08 ± 0.43		33.0 ± 1.83	d	4.1 ± 0.61		14.1 ± 1.46	c	12.2 ± 1.10		45.7 ± 2.20		14.0 ± 1.18	
½ IF ½ C (3)	3.44 ± 0.41		41.8 ± 1.74	abcd	3.8 ± 0.58		24.9 ± 1.39	ab	10.5 ± 1.05		41.2 ± 2.09		14.9 ± 1.12	
½ MI ½ C (3)	2.94 ± 0.45		38.7 ± 1.91	bcd	2.7 ± 0.63		21.9 ± 1.52	ab	11.8 ± 1.15		37.3 ± 2.30		14.3 ± 1.22	
½ HD ½ MA (4)	3.33 ± 0.50		49.7 ± 2.15	a	4.7 ± 0.71		28.2 ± 1.71	a	15.1 ± 1.30		39.9 ± 2.59		6.5 ± 1.38	
½ SD ½ MA (4)	2.69 ± 0.50		46.8 ± 2.15	ab	4.1 ± 0.71		26.0 ± 1.71	ab	14.4 ± 1.29		41.4 ± 2.58		8.4 ± 1.38	
½ IF ½ MA (4)	3.71 ± 0.42		48.4 ± 1.78	a	4.9 ± 0.59		25.8 ± 1.41	ab	15.6 ± 1.07		38.9 ± 2.14		8.8 ± 1.14	
MA (4)	4.22 ± 0.41		49.4 ± 1.73	a	4.9 ± 0.57		27.0 ± 1.38	a	14.9 ± 1.04		37.2 ± 2.09		9.5 ± 1.11	
½ HD ½ RM (5)	3.21 ± 0.42		42.4 ± 1.80	abcd	4.1 ± 0.60		22.4 ± 1.43	ab	12.9 ± 1.08		41.5 ± 2.16		7.0 ± 1.15	
½ SD ½ RM (5)	3.54 ± 0.38		44.4 ± 1.64	abc	4.0 ± 0.54		23.0 ± 1.31	ab	13.9 ± 0.99		43.4 ± 1.97		7.0 ± 1.05	
½ IF ½ RM (5)	3.24 ± 0.38		45.1 ± 1.61	ab	4.1 ± 0.53		22.8 ± 1.29	ab	13.9 ± 0.97		43.1 ± 1.94		6.6 ± 1.04	
RM (5)	2.81 ± 0.44		41.9 ± 1.87	abcd	4.0 ± 0.62		21.6 ± 1.49	abc	12.6 ± 1.12		44.1 ± 2.24		6.9 ±1.20	
½ SD ½ C (6)	2.92 ± 0.35		47.8 ± 1.49	a	5.6 ± 0.49		24.8 ± 1.19	ab	14.1 ± 0.90		33.5 ± 1.79		12.6 ± 0.96	
½ SD ¼ TX ¼ C (6)	3.58 ± 0.39		46.8 ± 1.67	ab	4.8 ± 0.55		23.5 ± 1.33	ab	15.7 ± 1.01		37.2 ± 2.01		10.5 ± 1.07	
½ SD ¼ IF ¼ C (6)	3.54 ± 0.40		46.2 ± 1.70	ab	5.6 ± 0.56		23.6 ± 1.35	ab	13.4 ± 1.02		35.2 ± 2.04		12.5 ± 1.09	
½ SD ¼ MI ¼ C (6)	2.79 ± 0.35		46.2 ± 1.51	ab	5.1 ± 0.50		24.4 ± 1.21	ab	13.5 ± 0.91		36.4 ± 1.82		12.5 ± 0.97	
C (7)	2.11 ± 0.41		49.0 ± 1.76	a	5.1 ± 0.58		25.2 ± 1.40	ab	15.5 ± 1.06		32.2 ± 2.11		11.1 ± 1.13	

ns: p>0.05; (+): p≤0.05; (*):p≤0.01; (**):p≤0.001; (***): p≤0.0001; (a,b,c,d): p≤0.05.