EFFECT OF SUPPLEMENTARY ENERGY SOURCE ON TEXEL LAMB MEAT QUALITY

Cossu M. E., Frey A., Wawrzkiewicz M., Dulce, E., Jaurena G.
Departamento de Producción Animal, Facultad de Agronomía, Universidad de Buenos Aires, Av. San Martín 4453, 1417 Buenos Aires Argentina.

Background

Market demand for sheep meat in Argentina is typically concentrated in December, when lambs reach 20 to 25 kg live weight (LW) after weaning (70 to 120 days of life). These lambs are traditionally raised on low-input grazing systems receiving low or no supplements at all. Lambs are ussually sold by butchers as whole or half carcasses; but to obtain marketable meat-cut product, lambs should be raised to near 40 kg LW, achieving good conformation characteristics and low fat content in the carcass. Beside this, the productive system must assure predictability, finishing lambs with the adequate quality in time. World-wide there is a marked interest to define sheep meat quality, especially regarding the influence of the diet in post-weaning growth (Sarti *et al.*, 1993; Phillips *et al.*, 1996; Sañudo *et al.*, 1998; Kasapidou *et al.*, 2000)

Ensiling is a well-known technique to preserve forages with increasing diffusion within the central humid areas of Argentina. Typically, diets based on silage present high rumen degradable nitrogen and low fermentecibles carbohydrates (Pichard and Rybertt, 1993). It is also known, that diets based on fermented forages (silage and haylage) present lower voluntary food intake (VFI) than expected according to their chemical composition (Blackbrun *et al* 1998; Cossu *et al.,* 1995) . Nevertheless, by the pasture harvest season, conservation of pastures as silage has also shown good nutritive quality and is less risky than hay-making due to the shorter field exposure to wheather conditions.

Objectives

The main goal of this experiment was to assess the carcass and meat quality of Texel lambs slaughtered at 50 days postweanig (near 40 kg LW) and fed on pasture silage or alfalfa hay supplemented with wheat or sorghum grains.

Methods

Thirty Texel male-castrated lambs, which averaged 25 kg LW were allocated randomly to individual pens and to the following feeding treatments: mix-pasture silage (Si), silage plus wheat grain (Si+W), silage plus sorghum grain (Si+So), alfalfa hay (H), alfalfa hay plus wheat grain (H+W) and alfalfa hay plus sorghum grain (H+So); the energy supplement was given at 1% LW. After 50 experimental days lambs were slaughtered after a 24 hs fasting, slaughter wastes were removed. The carcasses were commercially evaluated by an expert for fat level, conformation and colour. Details and previous results related with this experiment have already been published in Dulce *et al.* (200). Chemical analysis were determined by AOAC (1985). Warner-Bratzler shear force was measured on the *Longissimus dorsi* muscle sampled between the 12th and 13th rib using Instron 1011 apparatus on 3 cooked carrot samples (1 cm^2 diameter; 75°C, 50'). Fatty acids were extracted according to Folch *et al.* (1957) and analysed by gas chromatography (Shimadzu GC-14B) of the respective methyl-esters on a capillary column (Ulbon HR-SS-10; 0,32 I.D.x 50 mL) and using Helium as carrier gas. Data were analyzed according to a complete ramdomised block desding using GLM procedure of SAS (1998). Treatment means were compared by Tukey test (5 %).

Results and discussion.

Lambs fed on hay-based diets were significantly heavier at slaughter than those offered silage-based diets (39 *vs.* 30 kg LW for groups offered diets based on hay and silage respectively; $P<0.05$; Table 1). Conformation and fat level achieved optimal values only in those lambs raised on hay-supplemented diets; fat deposition on carcasses obtained from Si diet was scarce. Carcass colour for Si treatment was dark red, differing significantly from the rest of the treatments as shown in (Dulce *et al.,* 2000). Fatter lambs presented more intramuscular fat without differences in protein level; in general, only the chemical composition of meat from lambs fed silage diet tended to be different from the others. Our data confirmed Sarti *et al.* (1993) results where age of slaughter and nutritive level of postweaning diets did not influence the level of protein and ash in muscles, but high nutritive level increase ether extract. Fatty acid composition of LD differed significantly between treatments only for C12:0, C14:0, C18:1 and C18: 3 (Table 2; $P < 0.05$). *Longissimus dorsi* from lambs offered hay-based diets and Si+So treatment presented lower C12:0 concentration than Si ones; animals fed with Si+W presented an intermediate and non-significant different value from the other treatments. Fatty acid C14:0 was higher in *Longissimus dorsi* from lambs fed on hay based diets, differing significantly only from those animals fed on silage alone, but with intermediate values for those reared on silage-supplemented diets.

Although no statistically different, hay-based diet treatments presented higher concentration of monounsaturated fatty acids (MUFA= 44.1% *vs* 41.4%), due the high 18:1 FA content, and lower concentration of polyunsaturated fatty acids (PUFA= 6.89% *vs* 7.45%) characterised for the lower total of n-6 FA (linoleic and arachidonic acids). Our results showed that at low level of grain supplementation there were no differences on linoleic and CLA (Conjugated Linoleic Acid) content for H and Si diets; linolenic concentration was significantly higher for H. Supplemented lamb carcasses had the disadvantage of a high n-6/n-3 ratio, which exceeded the recommendation of the U.S. Department of Health (value 4.0; 1994); only Si, H and H+So diets showed values near to 4.0.

Conclusions

The results of this study show a better response of alfalfa hay on productive and quality carcass traits respect to pasture silage. Grain supplementation (wheat or sorghum), cancelled differences of basic diets. Carcass colour was better with weat-supplemented diets. Energy supplementation increase intramuscular ether extract content but not in excess. Basic diets showed a tendence for better n-6/n-3 ratio. At this level of supplementation, there weren't differences for C18:2 and CLA contents. Only H diet showed higher percentage of linolenic acid.

Pertinent Literature

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Table 1. Effect of diet on carcass appearance and meat quality traits

	Si	Si+W	Si+So	H	H+W	H+So	Rsd
Final weight (kg)	24.5 ^{a}	27.8 ^{ab}	30.3 ^{b}	34.3 ^{c}	37.5 ^{c}	36.3 ^{c}	2.1
Conformation (1)	5.0 ^{c}	3.0 ^{b}	3.3 ^{bc}	2,7 ^{b}	1.3 ^{a}	1.3 ^{a}	0.9
Fat level(2)	0.1 ^{a}	1.0 ^{c}	1.3 ^{c}	1.3 ^{c}	2.0 ^{d}	2.2 ^{d}	0.3
Colour(3)	1.0 ^{a}	3.7 ^{b}	3.0 ^{b}	3.0 ^{b}	3.7 ^{b}	3.0 ^{b}	0.9
WB shear force (kgf)	1.19 ^{a}	1.97 ^{b}	2.29 ^{b}	2.23 ^{b}	1.68 ^{ab}	1.73 ^{ab}	0.54
Chemical composition (%)							
Humidity	74.0 ^{b}	70.5 ^{a}	69.0 ^{a}	69.6 ^{a}	70.0 ^{a}	69.0 ^{a}	1.5
Protein	20.6	21.7	22.2	21.2	22.4	22.4	1.4
Ether extract	4.06 ^{a}	6.43 ^{ab}	7.29 ^{b}	7.84 ^{b}	6.19 ^{ab}	7.15 ^{b}	1.34
Ash	1.26	1.46	1.59	1.38	1.38	1.44	0.26

(1) Conformation (E=1, U= 2, R= 3, O= 4, P= 5). (2) Fatness (0= very scarce, 1= scarce, 2= optimal, 3= fat, 4= very fat); (3) Colour (1= dark red, 2= red, 3= pink-red, 4= pink, 5= pale); a, b, c, d= $P<0.05$.

Table 2. Effect of diet on fatty acid composition of *Longissimus dorsi*

	Si	Si+W	Si+So	H	H+W	H+So	Rsd
C12:0	0.81 ^{A}	0.51 ^{AB}	0.43 ^{B}	0.33 ^{B}	0.29 ^{B}	0.41 ^{B}	0.18
C14:0	6.02 ^{A}	4.59 ^{AB}	4.00 ^{AB}	3.47 ^{B}	3.34 ^{B}	3.70 ^{B}	1.09
C14:1	0.45	0.31	0.33	0.26	0.37	0.25	0.14
C15:0	0.84	0.48	0.54	0.52	0.62	0.54	0.28
C15:1	0.24	0.22	0.26	0.20	0.17	0.21	0.05
C16:0	24.4	26.2	26.3	27.0	26.9	25.0	1.6
C16:1	1.65	1.55	1.54	1.36	1.49	2.61	0.7
C17:0	1.20	1.62	1.10	1.32	1.16	1.11	0.19
C17:1	1.06	1.20	1.08	1.00	0.98	0.69	0.36
C18:0	16.5	18.5	19.4	17.7	17.1	16.7	2.3
C18:1	38.2 ^{b}	38.0 ^{b}	37.7 ^{b}	39.1 ^{ab}	41.1 ^{a}	42.0 ^{a}	2.5
C18:2	3.96	3.77	3.81	3.42	3.20	3.24	0.8
C18:3	1.02 ^{B}	0.87 ^{B}	0.91 ^{B}	1.68 ^{A}	1.01 ^{B}	1.22 ^{AB}	0.30
CLA	1.66	1.32	1.24	1.27	0.98	1.20	0.40
C20:1	0.15	0.10	0.10	0.13	0.11	0.10	0.05
C20:2	0.25	0.13	0.10	0.15	0.25	0.15	0.16
C20:4	1.00	0.60	0.63	0.54	0.42	0.45	0.54
C20:5	0.51	0.31	0.45	0.47	0.30	0.35	0.30
C22:6	0.01	0.09	0.15	0.11	0.10	0.07	0.07
SFA	49.8	51.9	51.8	50.4	49.4	47.5	0.02
MUFA	41.8	41.4	41.0	42.1	44.2	45.9	0.02
PUFA	8.41	6.72	7.22	7.61	6.37	6.68	0.02
n-6/n-3	4.04	10.8	13.4	5.90	17.3	6.98	6.84

A, B= 0.01; a, b= $P<0.05$.