Effect of feeding linseed to lambs on growth parameters, adipose tissue metabolism and meat fatty acid composition

A. Arana*, J. A. Mendizábal, K. Insausti, F. Maeztu, P. Eguinoa, V. Sarries,

M.J. Beriain, B. Soret, A. Purroy.

*aarana@unavarra.es

ETSIA. Universidad Pública Navarra. Pamplona. SPAIN

Nutritional Recommendations

× ↓ FA Saturated (SFA)

× PUFA/SFA ≈ 0.45

× n6 / n3 < 4

× ↑ Linolenic, EPA, DHA

✴ Objectives

✕ **Effect of feeding linseed to lambs on:**

- ✓ **growth parameters and adipose tissue development and metabolism**

- ✓ **FA composition of intramuscular and SC adipose tissues**

- ✓ **meat quality and sensory analysis**

Material and Methods

✱ **Growth and carcass parameters**

    ✘ **Growth rate**
    ✘ **Backfat thickness**
    ✘ **Conformation Score**
    ✘ **Fattening Score**
    ✘ **Perirenal fat**

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Material and Methods

✗ **Slaughter and adipose tissue sampling**

PR

Fat adjacent to the right kidney

SC

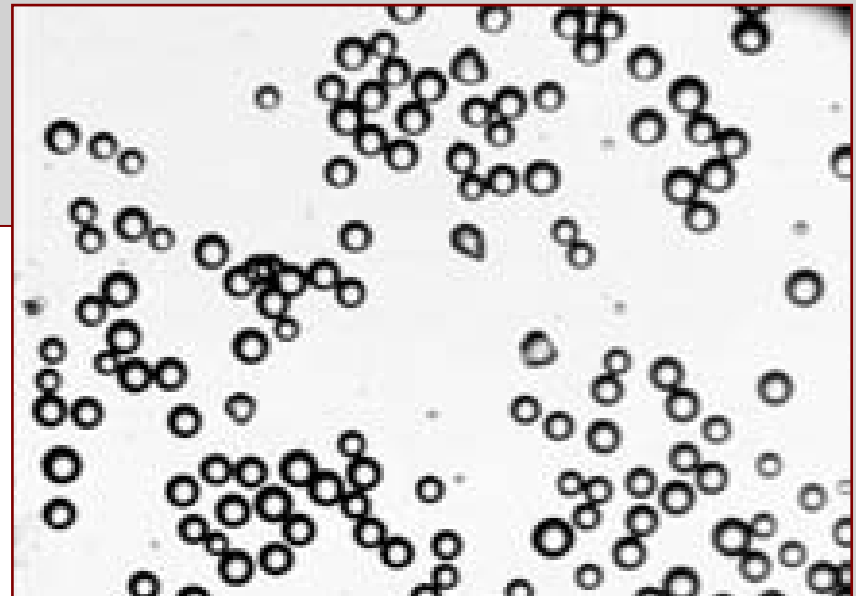**Tail head subcutaneous**

IM

Longissimus Dorsi (last rip)

Material and methods

✴ **Adipose tissue development**

  ✖ **Adipocyte size**

  ✖ **Adipocyte number**

  ✖ **Lipogenic enzyme activities G3PDH, FAS, ICDH, G6PDH**

  ✖ **Enzyme RNA expression ACC, LPL, y SCoA**

Material and Methods

✳ Meat quality and fatty acid composition

- ✘ Meat colour
- ✘ pH
- ✘ SC adipose tissue quantity (10th rip dissection)
- ✘ IM quantity of fat (image analysis)
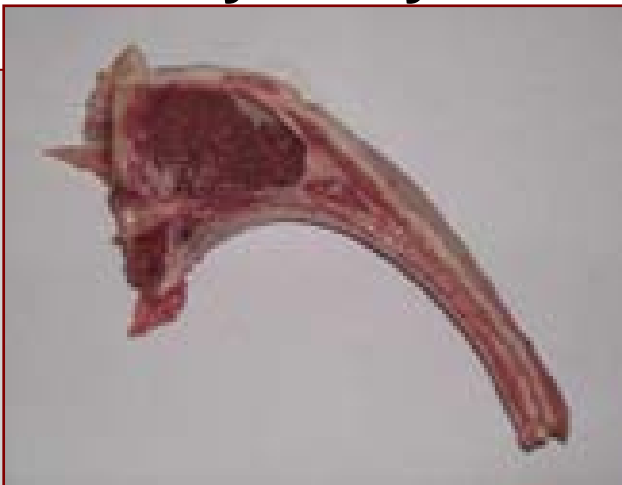- ✘ Adipose tissue composition (FAs)
- ✘ Sensory analysis

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Material and Methods

Feeds (% FM)	Control	Lins. 5%	Lins. 10%
Barley	81.17	75.87	70.51
Soya 44	15.23	13.05	10.88
Valomega 160	0.00	7.48	15.01
Vit – Min	3.60	3.60	3.60
CP	14.56	14.35	14.48
CF	4.64	4.83	5.08
EE	2.11	4.50	6.32
ME (Mcal/kg)	2.70	2.75	2.82
Ash	5.52	5.94	6.02

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Material and methods

Feeds: FA composition (%)	Control	Lins 5%	Lins 10%
C16:0	23.95	18.59	13.22
C18:0	3.29	3.25	3.20
C18:1c9	12.13	13.97	15.81
C18:2n6c9c12 (LA)	48.54	39.52	30.49
C18:3n6	0.05	0.11	0.17
C20:0	0.11	0.12	0.13
C18:3n3c9,c12,c15 (ALA)	4.43	18.96	33.49
9c11t (CLA)	0.24	0.25	0.25

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Material and Methods
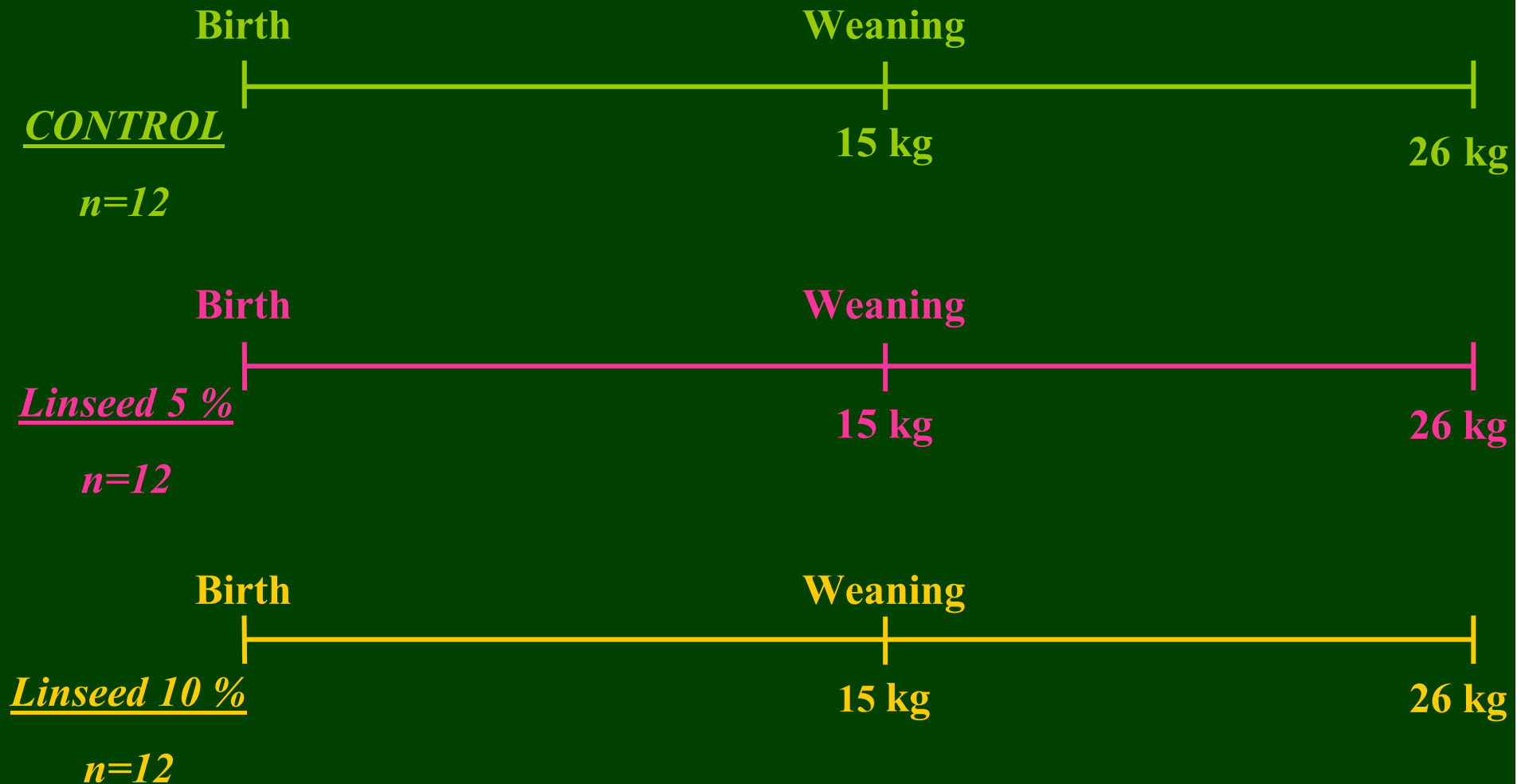
Fattening Feeds: Barley and soya

CONTROL
n=12

Birth | Weaning |
| 15 kg | 26 kg

Linseed 5 %
n=12

Birth | Weaning |
| 15 kg | 26 kg

Linseed 10 %
n=12

Birth | Weaning |
| 15 kg | 26 kg

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Results

	Control	Lins 5%	Lins 10%	P
LW weaning (Kg)	15.3	15.2	15.2	ns
LW slaughter(Kg)	26.6	26.3	26.5	ns
ADG fatten.(g/d)	317.0	315.0	319.0	ns
CCW (Kg)	11.4	11.6	11.5	ns
FS (1-15)	5.8	6.3	6.6	ns
CS (1-15)	6.6	6.8	6.3	ns
BFT (mm)	3.0	3.0	3.2	ns
PR fat (g)	182.2	220.4	208.2	ns

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Results

	Control	Lins 5%	Lins 10%	P
10th rib weight (g)	73.93	74.78	75.75	ns
SC fat (g)	9.82	11.69	11.54	ns
IM fat (g)	5.59	6.33	6.57	ns
LD surface (cm^2)	19.87	19.00	19.65	ns
IM fat (%)	2.34	2.17	2.25	ns
Marbling flecks (n)	6.08	6.21	6.25	ns
Mean size marbling flecks (mm^2)	9.74	7.57	8.48	ns

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	Control	Lins 5%	Lins 10%	P
PR diameter (μm)	72.6	78.9	75.6	ns
SC diameter (μm)	80.1	85.7	79.3	ns
IM diameter(μm)	33.5	35.7	35.8	ns

There were not significant differences in the number of adipocytes

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Results: enzyme activity

Lipogenic activity (nmol/min/10^6adipocyte)		Control	Lins 5%	Lins 10%	P
SC	G3PDH	1024.0	1039.0	927.0	ns
	FAS	39.5	51.4	50.6	ns
	ICDH	788.6	845.0	793.2	ns
	G6PDH	41.9	54.6	56.4	ns
IM	G3PDH	1389.4	1424.7	1428.8	ns
	FAS	73.2	88.9	62.3	ns
	ICDH	2405.0	2516.0	2600.3	ns
	G6PDH	49.5	73.5	70.9	ns

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Results: IM fatty acid composition

IM depot	Control	Lins. 5%	Lins. 10%	Sig.
C18:1t11	4.69^a	5.82^a	7.62^b	***
C18:2n6c9c12 (LA)	7.10^a	6.28^{ab}	5.68^b	*
C18:3n6	0.10^a	0.08^{ab}	0.07^b	**
C18:3n3c9,c12,c15 (ALA)	0.47^a	0.92^b	1.11^b	***
SFA	48.66	47.83	47.92	ns
MUFA	39.37^a	40.89^b	41.12^b	**
PUFA	10.33	9.84	9.46	ns
PUFA/SFA	0.26	0.24	0.23	ns
n6	9.50	8.49	7.88	ns
n3	0.83^a	1.35^b	1.58^b	***
n6/n3	13.49^a	6.47^b	5.37^b	***

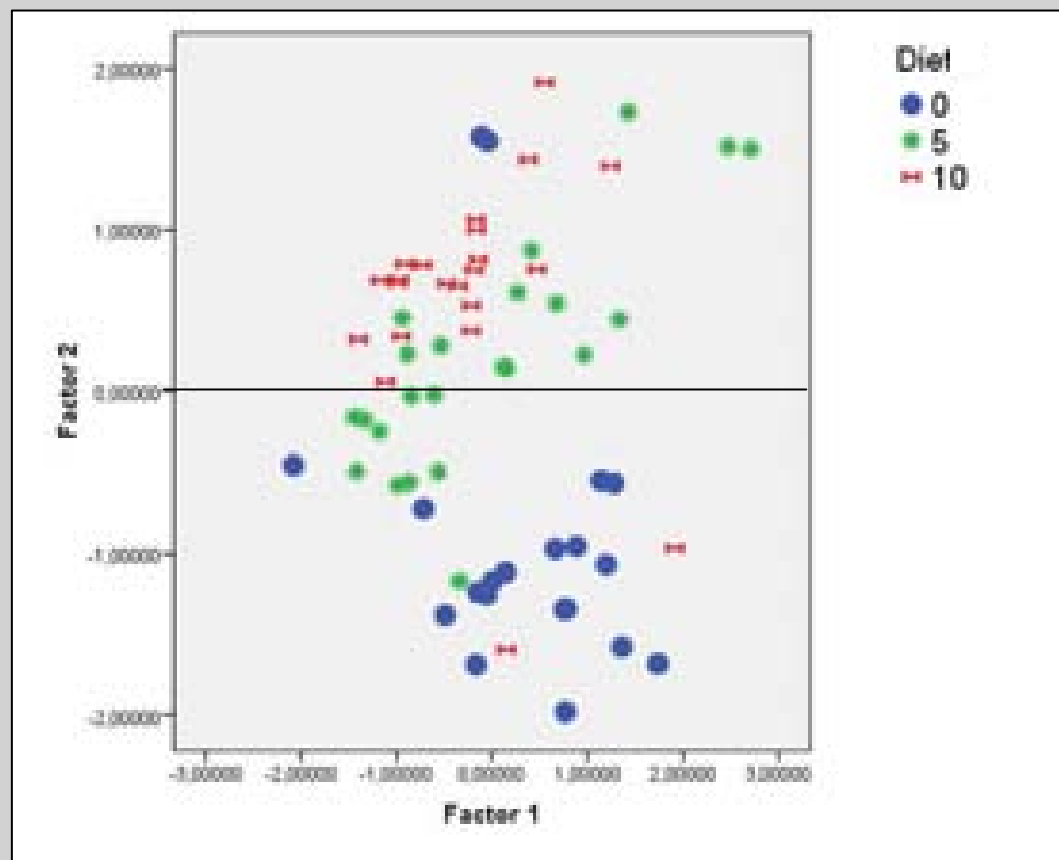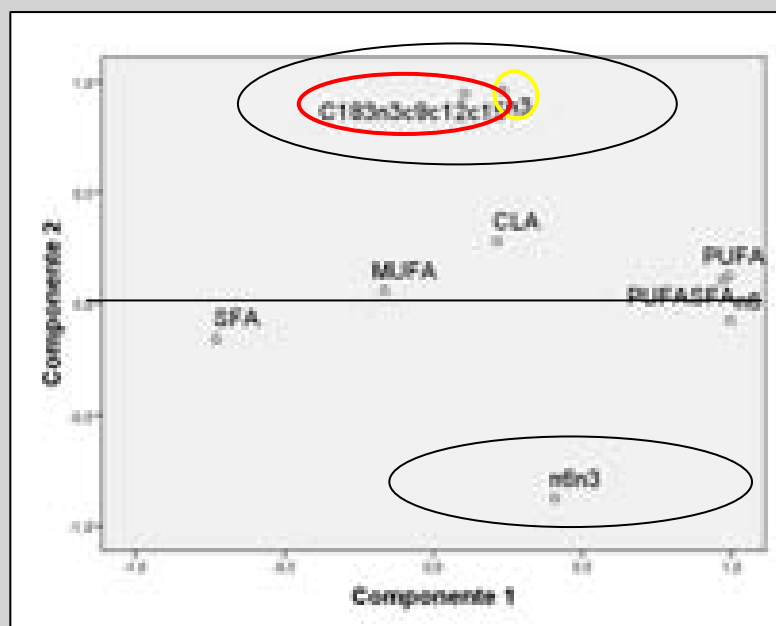# Effect of feeding linseed to lambs on growth parameters, adipose tissue metabolism and meat fatty acid composition

Results: SC fatty acid composition

| SC depot	Control	Lins 5%	Lins 10%	Sig.
C18:1t11	9.30[a]	11.23[ab]	13.71[b]	**
C18:2n6c9c12 (LA)	4.36[a]	3.00[b]	2.61[b]	***
C18:3n6	0.07[a]	0.05[b]	0.05[b]	**
C18:3n3c9,c12,c15 (ALA)	0.64[a]	1.10[b]	1.18[b]	***
SFA	51.04[a]	53.36[b]	51.95[ab]	*
MUFA	40.61	39.62	40.85	ns
PUFA	5.83[a]	4.96[b]	4.97[b]	*
PUFA/SFA	0.14[a]	0.13[ab]	0.12[b]	*
n6	4.94[a]	3.63[b]	3.48[b]	***
n3	0.89[a]	1.33[b]	1.49[b]	***
n6/n3	6.29[a]	2.81[b]	2.48[b]	***

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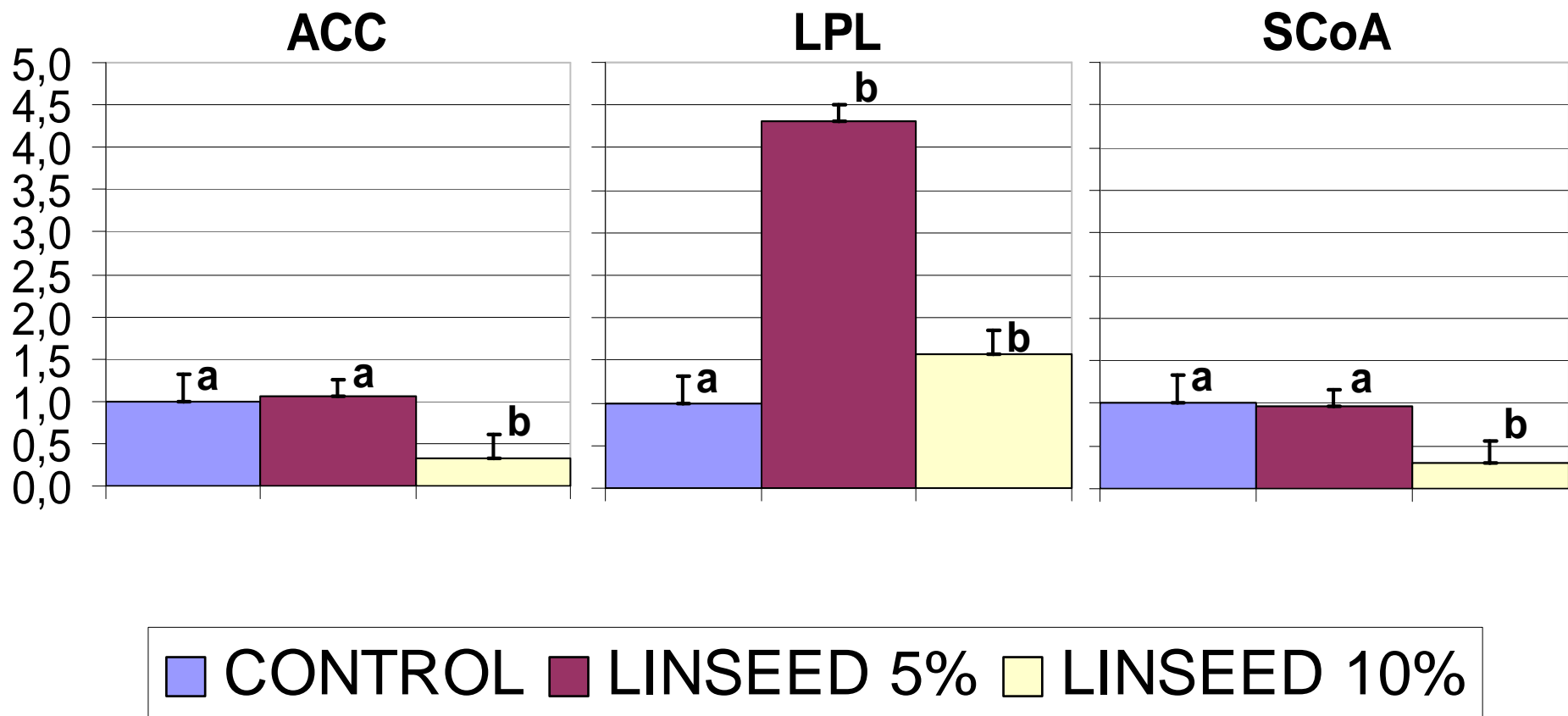
Results

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Results: meat quality and sensory analysis

There were not significant differences between groups on Meat colour parameters and pH values