UNIVERSITÀ DI PISA

Effects of supplementation with linseed and olive cake on fatty acid composition and lipid oxidation of lamb meat

Conte G., Mele M., Pauselli M., Luciano G., Serra A., Morbidini L., Lanza M., Pennisi P., Secchiari P.

EAAP 2010
61st Annual Meeting of the European Association for Animal Production
AUGUST 23RD - 27TH, 2010
HERAKLION - CRETE ISLAND
GREECE

… it is widely recommended an increase of PUFA ω-3

European Food Safety Authority assessed the consumption of:

- α-linolenic acid (LNA, C18:3 ω-3) in adults at 2 g/d;
- the daily intake for eicosapentaenoic acid (EPA; 20:5 ω-3) and docosahexaenoic acid (DHA; 22:6 ω-3) should be 0.25 g.

The American Heart Association recommended:

- a reduction of the saturated fatty acids (SFA) content
- an increase of unsatured fatty acids (UFA) content, mainly ω-3

$$\frac{\omega\text{-}6}{\omega\text{-}3} < 4$$

INTRODUCTION

High rate of UFA in the diet increases the susceptibility of the meat to oxidation

Concomitant increases in dietary antioxidant are therefore necessary to prevent flavor deterioration due to lipid oxidation:

Olive cake is a source of polyphenols and may concurs to promote the use of a by-product of Mediterranean olive oil industry in animal diet.

Olive cake may contain appreciable amounts of olive oil (18–25% on dry matter), which represents an energy supplement and a source of oleic acid.

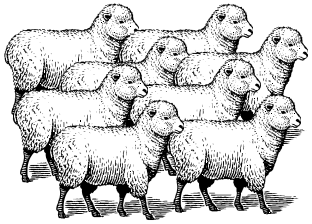
Aim of the work

The aim of this work was to evaluate the effect of linseed and olive cake supplementation on meat fatty acids composition and on lipid oxidation

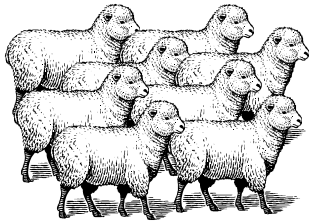
MATERIALS AND METHODS

The experiment was conducted on 32 Appenninica lambs

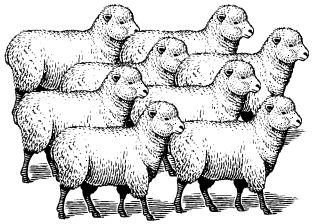
The lambs were weaned and randomly assigned to the following experimental groups of 8 animals each



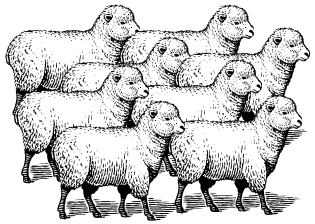
Control (C)



Linseed (L)
(20% concentrate DM)



Olive cake (O)
(35% concentrate DM)



Olive cake (17%) + Linseed
(10%) (OL)

The experimental diets were administrated according to a 30:70 forage:concentrate ratio

MATERIALS AND METHODS

Lambs were slaughtered at 90 days of age (average weight 29 ± 3 kg) in a public abattoir.

The *longissimus dorsi* muscle was excised from each carcass, wrapped in aluminum foil, vacuum packed and stored at -20°C until the analysis.

The samples were used for intramuscular fatty acid composition by gas-chromatograph analysis and 2-thiobarbituric acid reactive substances (TBARS) analysis

Effect of diet on meat fatty acids composition

Fatty acid	Diet				SEM	P<F
	C	L	OL	O		
SFA	33.92	31.51	35.17	32.64	1.39	0.30
MUFA	33.86	32.77	30.48	34.22	1.04	0.07
TFA	4.24 A	8.56 C	6.40 B	5.56 B	0.54	<0.001
PUFA	6.49 A	9.50 C	8.53 B	7.25 A	0.76	0.04
PUFA ω-6	4.80	4.45	5.09	5.55	0.62	0.64
PUFA ω-3	0.83 A	1.90 B	1.63 B	0.94 A	0.17	<0.001

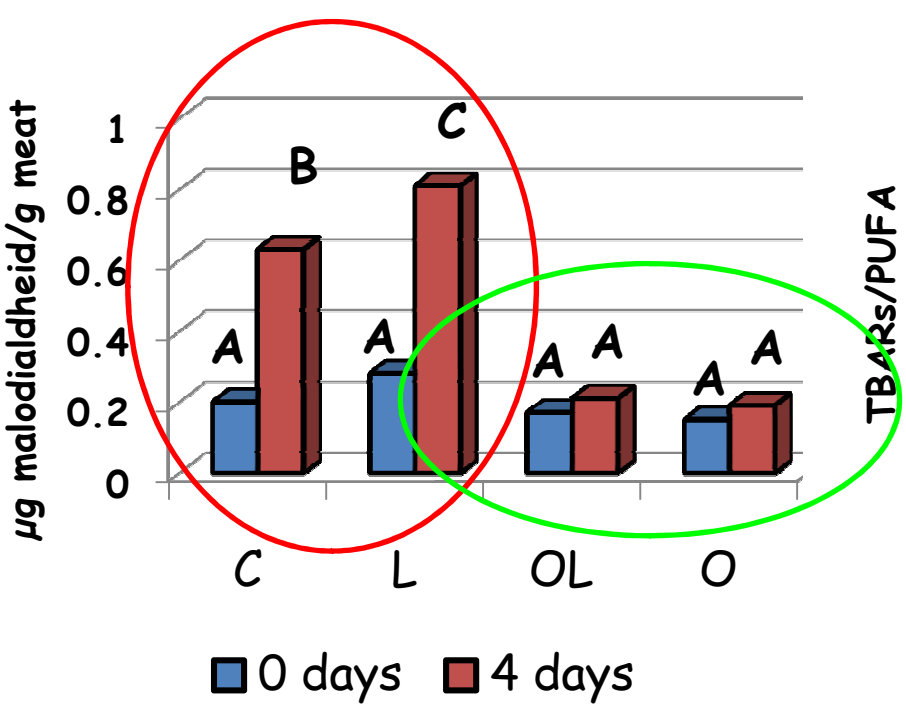
The presence of linseed in the diet increase significantly total PUFA , PUFA ω-3 and TFA content

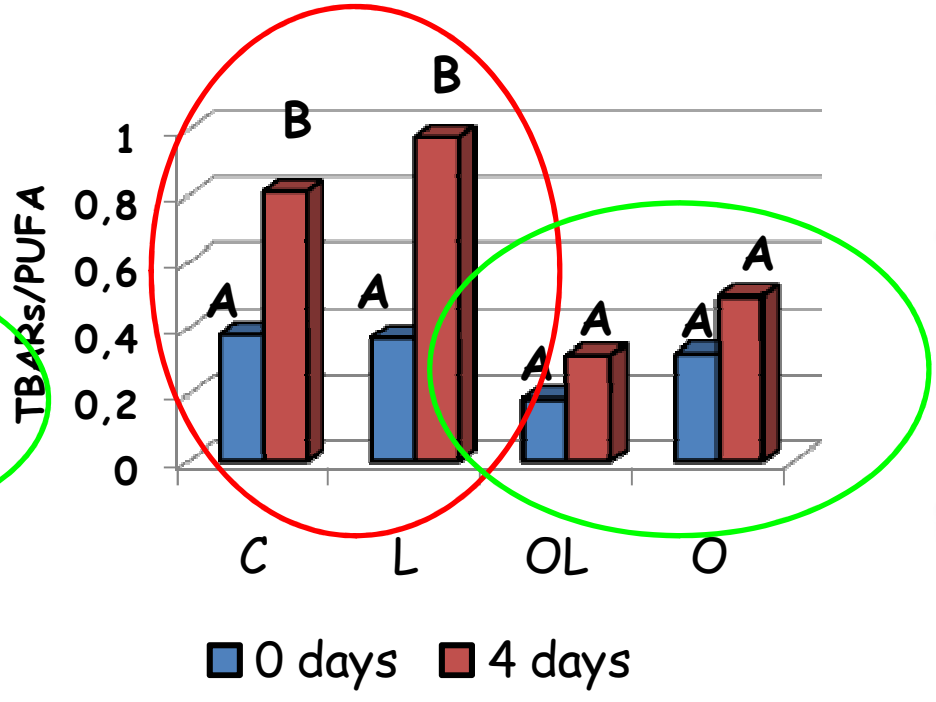
The higher content of *trans* FA (TFA) in meat from lambs fed L and, with a minor extent, OL diets was due to the bio-hydrogenation in the rumen of LNA contained in linseed

Although olive cake is rich in oleic acid, the content of oleic acid in intramuscular fat of lambs fed O diet did not significantly differ to that in meat fat from lambs fed C diet

RESULTS

Effect of diet on fatty acid oxidation





RESULTS

At time 0 the amount of TBARs in lamb meat was not different across diets

After 4 days of storage at 4 °C the amount of TBARs significantly increased only in meat of lambs fed C and L diet

The normalized values show that there is no significant difference between C and L, then the highest level of TBARs in group L was due to the higher level of PUFAs. While the TBARs level did not change in group OL although the higher level of PUFAs.

CONCLUSION

The dietary supplement of linseed increased significantly the content of PUFA ω-3 and CLA in lamb meat and reduce ω-6/ ω-3 ratio under 4

This data encourage the use of linseed in the diet to improve the meat quality

Unfortunately, meat of lamb fed with linseed shown a high lipid oxidation and a relatively short shelf-life

The presence of olive cake in the diet with linseed did not induce significant changes in meat in comparison with the diet with only linseed, but olive cake gives a more protection versus lipid oxidation activity

In conclusion olive cake may be considered a good solution for alls Mediterranean countries, which produce a lot of olive cake