Oxidative stability of meat from lambs fed silage mixtures of timothy grass, red clover and sainfoin

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Experimental design

40 Romane lambs, individually penned and fed with 5 different silages
(Control – Tannins – PPO - Combination)

- Timothy Grass (T)
- T+Sainfoin (T-SF)
- T+Red Clover (T-RC)
- SF+RC
- T+SF+RC
Silages containing bioactive forage legumes: a promising protein-rich feed source for growing lambs

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Focus on: Silage quality, animal intake and growth performances

Outcomes: RC-containing silages improve growth performances
Fatty acid composition of ruminal digesta and longissimus muscle from lambs fed silage mixtures including red clover, sainfoin, and timothy

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Analysis of: Fatty acids in rumimal digesta and intramuscular fat

Focus on: The effects on the fatty acid metabolism in lambs

Outcomes: Legume-containing silages increase n-3 fatty acids, with SF and RC having similar and additive effects
Lipid oxidation measurements

4°C - Darkness

Days: 0, 4, 7
(Raw meat slices)

Days: 0, 2, 4
(Cooked minced meat)

Fe^{3+} / Ascorbate

37°C - stirring

Minutes: 0, 30, 60, 90

Muscle homogenates
Legumes improve shelf life. Red clover particularly effective.

![Legumes improve shelf life. Red clover particularly effective.](image-url)
Fe^{3+} / Ascorbate

37°C - stirring

Legumes improve shelf life
Red clover particularly effective

The average TBARS of the period

T-RC < T-SF-RC < SF-RC < T-SF < T
Lower vitamin E associated to RC feeding were reported

Lee et al., 2009 – Meat Sci.
Al-Mabruk et al., 2004 - J. Dairy Sci.

However...
Inconsistency between diets and muscle vitamin E
No agreement with TBARS results
Secondary compounds: TANNINS & ISOFLAVONES

Can phenolics be responsible for the observed effects?

Copani et al., 2016

The content of condensed tannins in the silages

Sainfoin is known as a source of condensed tannins (CT). Therefore, the CT content of silages increased with increasing proportion of sainfoin
Secondary compounds: TANNINS & ISOFLAVONES

Can phenolics be partially responsible for the observed effects?

Condensed tannins
- Poor absorption
- Active metabolism
- Loss of antioxidant activity
- Uncertain in vivo antioxidant effects

ISOFLAVONES (daidzein, equol)
- Bioavailable and distributed in tissues
- Proved antioxidant properties
- In vivo antioxidant activity under investigation

However, red clover...

Manach et al., 2005
Mueller-Harvey et al., 2006
Halliwell et al., 2007
Lopez-Andrés et al., 2013

Rüfer & Kulling, 2006
Urpi-Sarda et al., 2008
Concluding remarks and next steps...

- Overall, feeding lambs with silage mixture of grass and with RC and/or sainfoin proved to be an advantageous practice.

- This specific study showed that such silage mixtures improve meat oxidative stability, with RC being particularly effective.

- Need of clarifying a number of key issues to understand the observed effects.

- A deeper characterization of phenolic compounds in silages will be performed.

- The analysis of muscle antioxidant capacity in the hydrophilic fraction might offer further insights.