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

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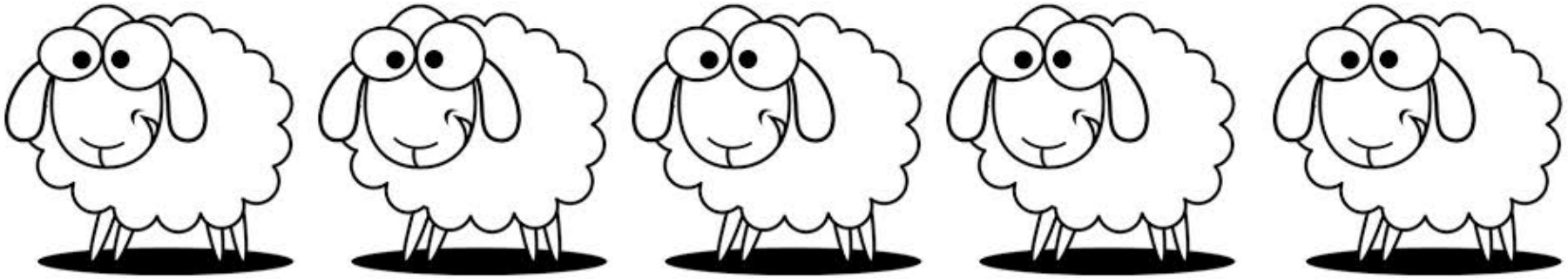
Experimental design



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)

T+SF+RC

SF+RC

Grass and Forage Science
The Journal of the British Grassland Society | The Official Journal of the European Grassland Federation

Silages containing bioactive forage legumes: a promising protein-rich feed source for growing lambs

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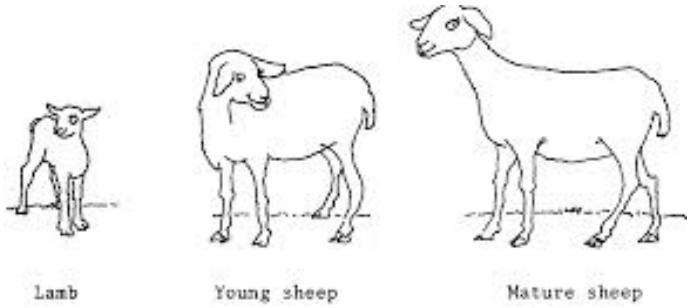

Focus on: Silage quality, animal intake and growth performances

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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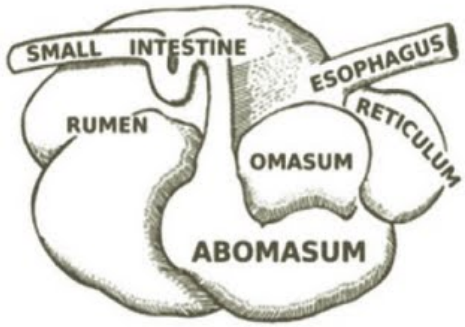
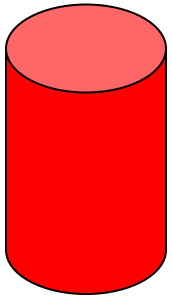


Analysis of: Fatty acids in rumimal digesta and intramuscular fat

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



Muscle homogenates

4°C - Darkness

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

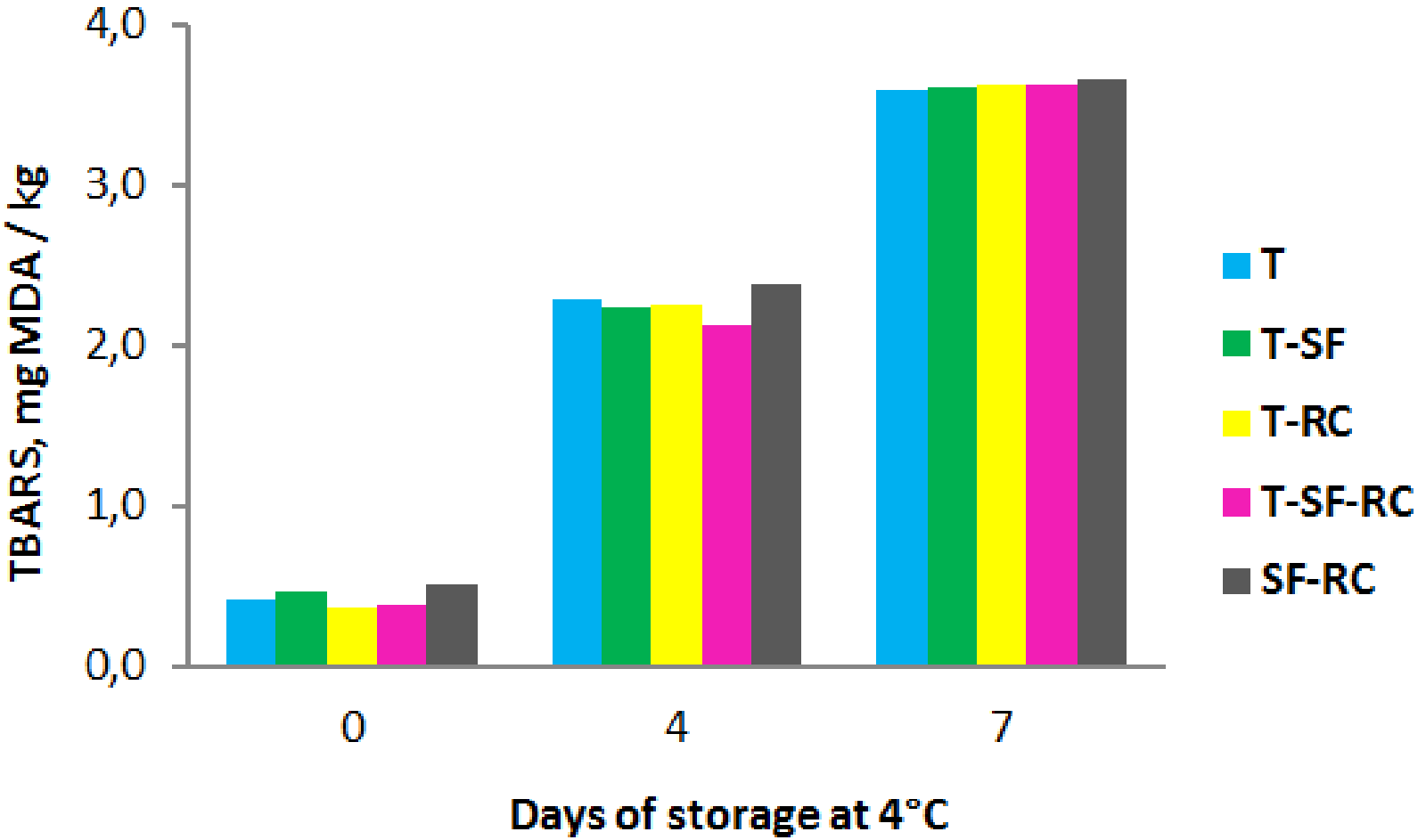
Days: 0, 2, 4
(Cooked minced meat)

Fe^{3+} / Ascorbate

37°C - stirring

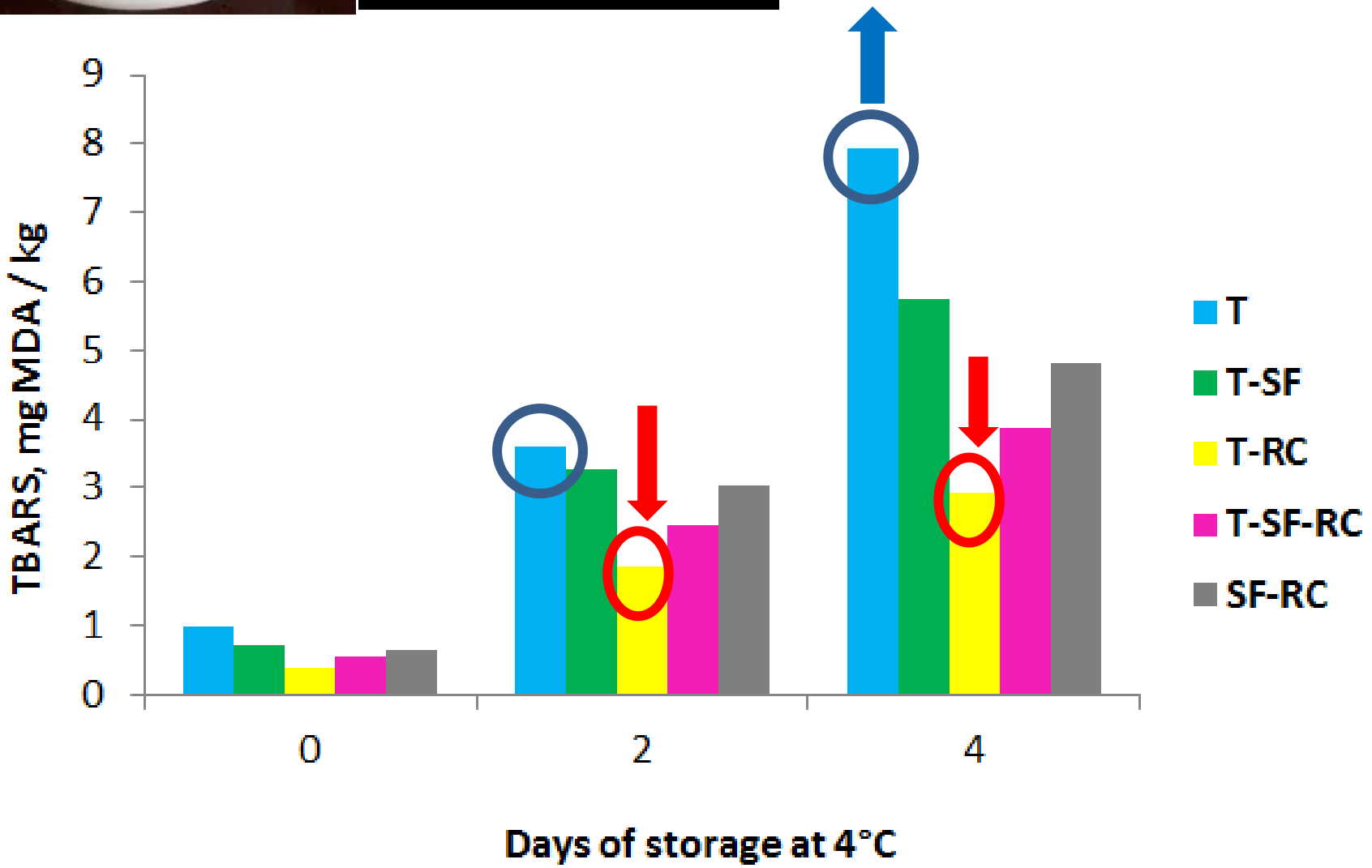
Minutes: 0, 30, 60, 90

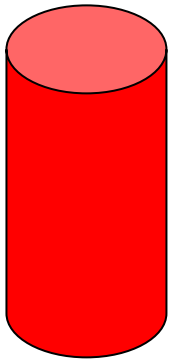
NO EFFECT


4,0
3,0
2,0
1,0
0,0
TBARS, mg MDA / kg
0
4
7
Days of storage at 4°C
T
T-SF
T-RC
T-SF-RC
SF-RC

Legumes improve shelf life

Red clover particularly effective





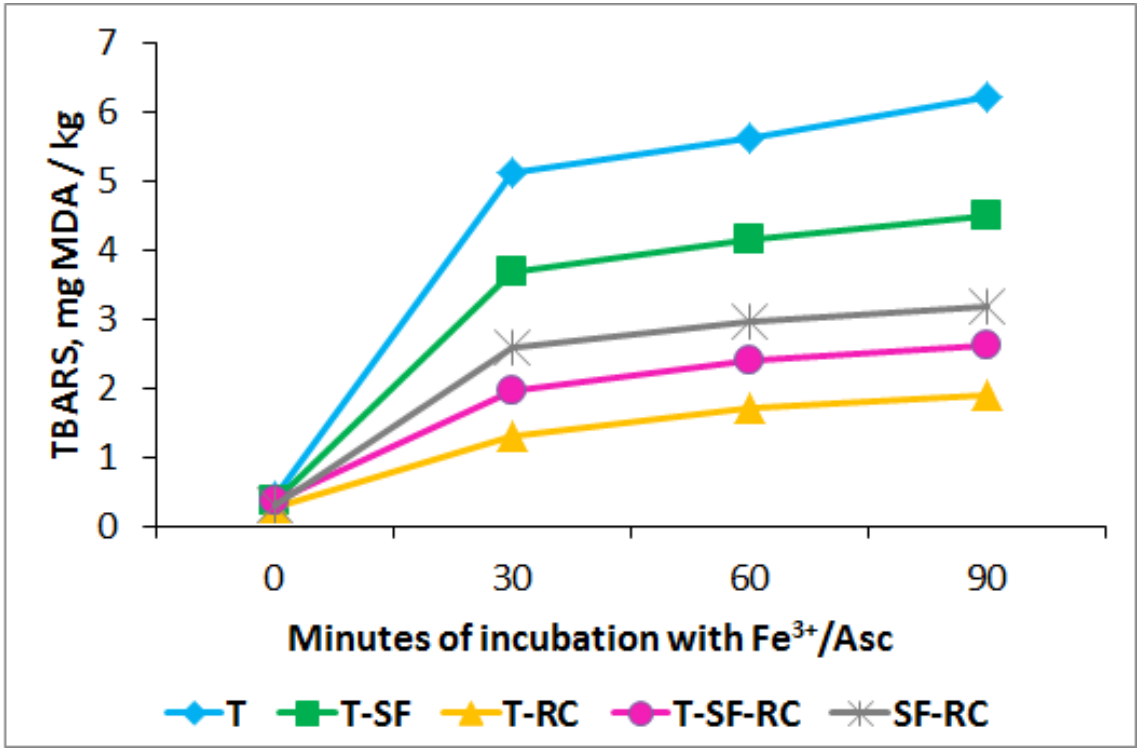
Fe^{3+} / Ascorbate

37°C - stirring

More evident trends

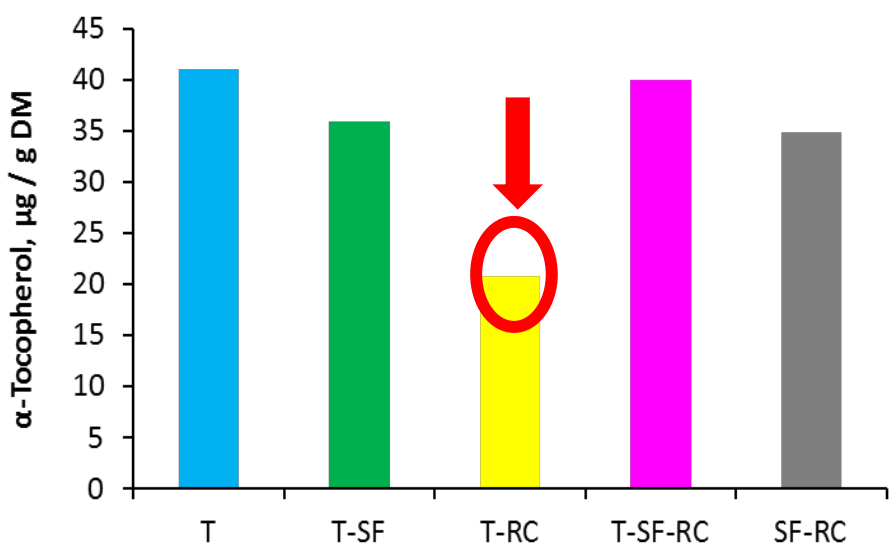
Legumes improve shelf life

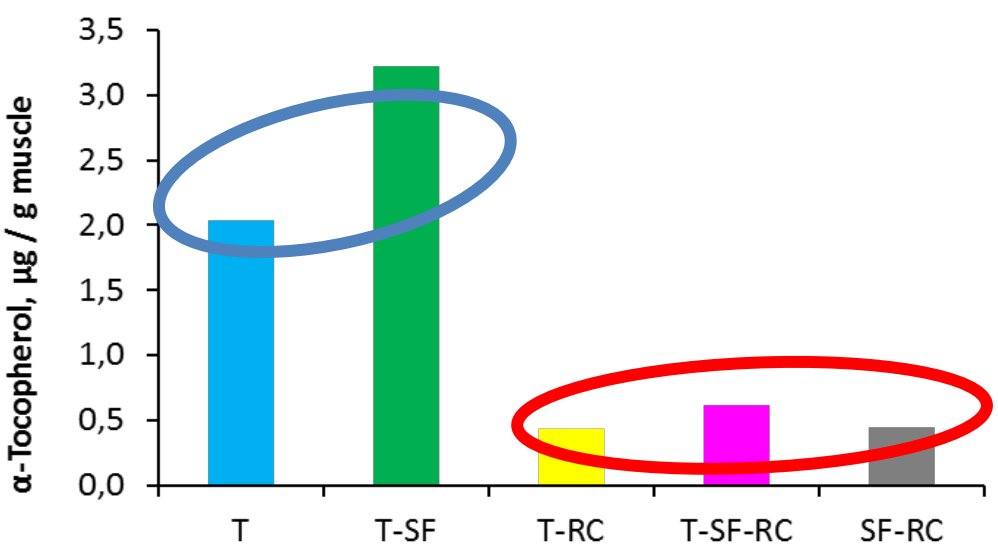
Red clover particularly effective



The average TBARS of the period

T-RC < T-SF-RC < SF-RC < T-SF < T





Vitamin E in silages

Vitamin E in muscle

Lower vitamin E associated to RC feeding were reported

Lee et al., 2009 – Meat Sci.

Al-Mabruk et al., 2004 - J. Dairy Sci.

Lynch et al., 2001 – Food Chem.

However…

Inconsistency between diets and muscle vitamin E

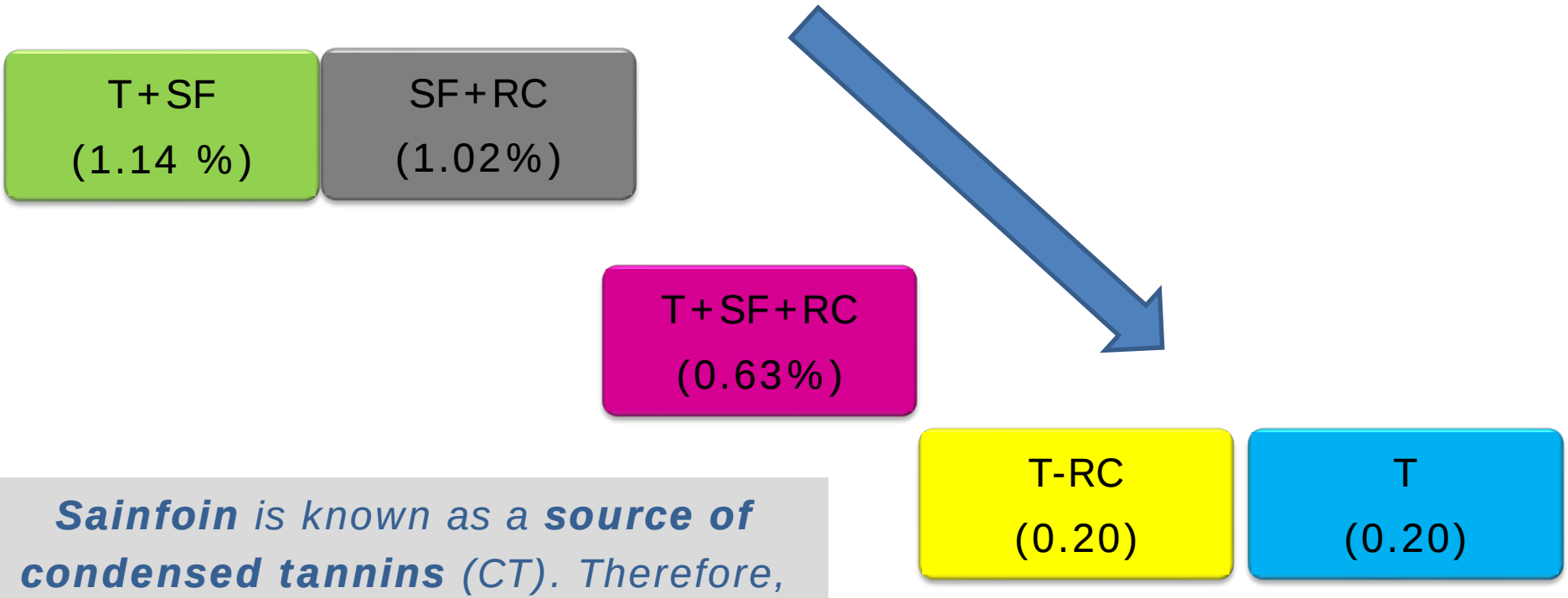
No agreement with TBARS results

Secondary compounds: TANNINS & ISOFLAVONES

Can phenolics be responsible for the observed effects?

Copani et al., 2016

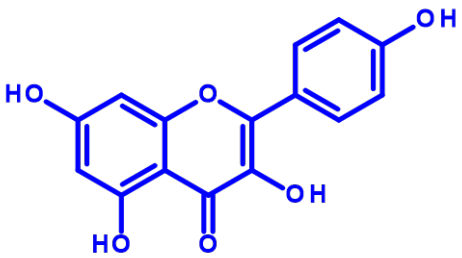
The content of condensed tannins in the silages

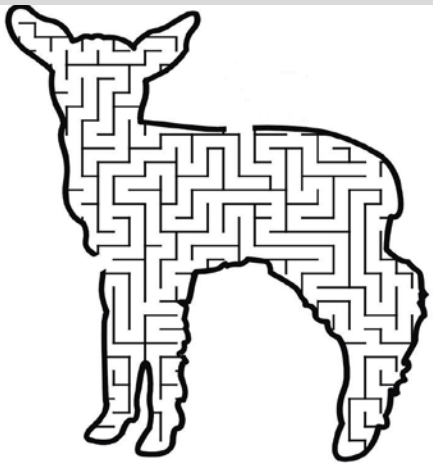


***Sainfoin** is known as a **source of condensed tannins** (CT). Therefore, the CT content of silages increased with increasing proportion of sainfoin*

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

Manach et al., 2005

Mueller-Harvey et al., 2006

Halliwell et al., 2007

Lopez-Andrés et al., 2013

However, red clover...

Isoflavones (daidzein, equol)

Bioavailable and distributed in tissues

Proved antioxidant properties

In vivo antioxidant activity under investigation

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