Effect of forage legumes on milk quality  
- review

Håvard Steinshamn

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Introduction

• Grassland legumes essential role in organic farming
  - N fixation capacity and productivity
  - Feeding value

• Renewed interest for grassland legumes in general
  - New research results
Objective

- Summarize the effect of grassland legumes in silage based diets on:
  - Feed intake
  - Milk production
  - Milk composition

Material methods

- Data gathered from literature
- Dairy cows on silage based diets
- Six different dataset created
  - Grass (G) vs. Legume (L), n=14
  - G vs. Red clover (RC), n=11
  - G vs. White clover (WC), n=7
  - RC vs. WC, n=6
  - Lucerne (M) vs. RC, n=5
  - RC proportion 0.5 vs. 1.0, n=5
Studies included and datasets created

<table>
<thead>
<tr>
<th>Reference (Experiment)</th>
<th>Legume species</th>
<th>Datasets</th>
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</thead>
<tbody>
<tr>
<td>Dallal et al. 1983 (1)</td>
<td>WC</td>
<td>X</td>
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<tr>
<td>Gersz et al. 1985 (2)</td>
<td>WC</td>
<td>X</td>
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<td>Therma et al. 1985</td>
<td>RC</td>
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<td>Randby 1982</td>
<td>RC</td>
<td>X</td>
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<td>Hoffman et al. 1977 (1)</td>
<td>RC, M</td>
<td>X</td>
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<td>RC, M</td>
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<td>Storde et al. 2000</td>
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<tr>
<td>Bartliss &amp; Murphy 2003 (1)</td>
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<td>Steinhorn &amp; Thuen 2008</td>
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<td>Vanharo et al. 2009</td>
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<td>Total number of comparisons</td>
<td>14</td>
<td>11</td>
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Material methods

Statistic

Simple t-test with experiment as replicate
Results

Dry matter intake (kg/day)
Milk yield (kg/day)

Milk fat content (g/kg)
Milk protein content (g/kg)

Milk fatty acid composition (g/100g FAME) n=8
Milk fatty acid composition (g/100g FAME) 
n=4

Milk equol content (Steinshamn et al. 2008)

WC vs. RC ***

RC, 7
RC, 0
WC, 7
WC, 0

Equol, µg/L

0 vs. 7 *
Milk equol content (Mustonen et al. 2009)

Summary grass vs legumes

- DMI
  - Legumes + 1.2 kg
  - Red clover + 1.1 kg
  - White clover + 1.3 kg
- Milk yield
  - Legumes + 1.6 kg
  - Red clover + 1.5 kg
  - White clover + 2.4 kg
Summary grass vs legumes

- Milk fat content
  - Legumes - 1.5 g/kg
  - Red clover - 1.9 g/kg
- Milk protein content
  - Red clover -0.5 g/kg
- Milk fatty acid composition
  - Red clover + C18:2n-6 and C18:3n-3

Legume species

- DMI
  - Lucerne vs. red clover +0.8 kg
- Milk yield
  - White clover vs. red clover + 1.0 kg
- Milk protein content
  - White clover vs. red clover + 0.6 g/kg
  - Lucerne vs. red clover + 0.6 g/kg
Legume species

- Milk fatty acid proportion
  - Red clover vs grass + C18:2n-6 and C18:3 n-3
- Milk equol content
  - Red clover vs. grass or white clover +

Conclusions

- Legumes increase DMI and milk yield relative to grass
- White clover is superior to red clover in milk yield
- Red clover is superior to lucerne in milk yield
Conclusions

• Red clover yields lower milk fat content than grass
• Red clover yields lower milk protein content than white clover and lucerne
• Increasing red clover proportion reduces milk protein content
• Red clover yields higher milk proportion of C18:2n-6 and C18:3n-3 than grass
• Red clover yields milk with high content of equol

Concluding remark

• Negative effect of red clover on milk fat and protein content warrants further research