The effects of forage type and feed value, concentrate feed level and protein concentration, and shearing, on lamb performance

T.W.J. Keady
and
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Introduction

- 20% of annual kill occurs Jan to March
- Large proportion finished on concentrate
- Ad-lib concentrate results in high levels of lamb performance (similar to pre-weaning) (Keady and Hanrahan, 2011)
- Improving grass silage feed value increases performance of
  - beef cattle (Steen 1987 and 2002, Keady et al 2008)
  - pregnant ewes (Keady and Hanrahan 2009, 2010)
Introduction II

- Maize silage inclusion increases performance of
  - beef cattle (Keady et al. 2005, 2006, 2007)
  - dairy cows (Keady et al. 2003, 2005, 2008)

- Maize silage can replace high FV grass silage for
  - pregnant ewes (Keady and Hanrahan, 2008, 2009)
  - finishing lambs (Keady and Hanrahan, 2011)

- Optimum maturity at harvest – DM of 300 g/kg
  (Keady 2005, Keady et al 2008)

- Concentrate substitution rate is
  - linear
  - increased as forage feed value improved
  (Keady and Hanrahan, 2011)
Aims

To evaluate the effects of
- forage type and feed value
- concentrate feed level
- concentrate crude protein concentration
- *ad libitum* concentrate feeding
- shearing
- and their potential interactions
  on the performance of finishing lambs

To determine the concentrate sparing effect of high feed value grass and maize silages
**Experimental design**

- 2 grass silages
  - harvested 24 May and 17 June
  - precision chopped treated with inoculant
- Maize silage - sown 23 April (CCPM), harvested 29 Sept
- 2 crude protein concs - 130 g/kg DM (LP)
  - 180 g/kg DM (HP)
- HP concentrate feed levels – 0.4, 0.8 and 1.2 kg/d
- Maize silage supplemented with 0.4 kg/d of LP conc
- *Ad libitum* conc plus 0.5 kg high FV silage
- 264 Suffolk-X castrate lambs for 54 days
- Half of lambs shorn
22 treatments

2 grass silages (high and medium FV)
and
Maize silage
X
HP conc – 3 feed levels (0.4, 0.8 and 1.2 kg/d)
plus
ad-libitum conc and 0.5 kg high FV silage
plus
Maize silage and 0.4 kg LP conc
X
2 shearing treatments (shorn, unshorn)
Assessments

- Food intake
- Live weight
- Carcass gain
- Carcass classification
- Blood analysis
**Ingredient composition of the concentrate (kg/t)**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Concentrate</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HP</td>
<td>LP</td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>360</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Citrus pulp</td>
<td>300</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>Soyabean meal</td>
<td>210</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Maize meal</td>
<td>100</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Molasses</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Mineral and vitamin supplementation**

<table>
<thead>
<tr>
<th>Diet</th>
<th>g/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass silage</td>
<td>20</td>
</tr>
<tr>
<td>Maize silage</td>
<td>30</td>
</tr>
<tr>
<td><em>Ad libitum</em> conc.</td>
<td>20</td>
</tr>
</tbody>
</table>
## Chemical composition of silages

<table>
<thead>
<tr>
<th></th>
<th>Silage</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grass</td>
<td>Maize</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Dry matter (g/kg)</td>
<td>262</td>
<td>251</td>
<td>309</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>3.9</td>
<td>3.9</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Crude protein (g/kg DM)</td>
<td>100</td>
<td>157</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>ME (MJ/kg DM)</td>
<td>11.3</td>
<td>11.7</td>
<td>11.8</td>
<td></td>
</tr>
<tr>
<td>DMD (g/kg DM)</td>
<td>713</td>
<td>749</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Potential DM intake (g/kgW^{0.75})</td>
<td>80</td>
<td>84</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Starch (g/kg DM)</td>
<td>-</td>
<td>-</td>
<td>253</td>
<td></td>
</tr>
</tbody>
</table>
**Effect of shearing on lamb performance**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Unshorn</th>
<th>Shorn</th>
<th>s.e.</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total DMI (kg/d)</td>
<td>1.29</td>
<td>1.39</td>
<td>0.013</td>
<td>***</td>
</tr>
<tr>
<td>Final live weight (kg)</td>
<td>47.6</td>
<td>46.6</td>
<td>0.31</td>
<td>**</td>
</tr>
<tr>
<td>Carcass weight (kg)</td>
<td>22.2</td>
<td>22.2</td>
<td>0.16</td>
<td>NS</td>
</tr>
<tr>
<td>KO (g/kg)</td>
<td>467</td>
<td>474</td>
<td>2.1</td>
<td>**</td>
</tr>
<tr>
<td>Carcass gain - g/d</td>
<td>87</td>
<td>86</td>
<td>2.8</td>
<td>NS</td>
</tr>
<tr>
<td>- g/MJ MEI</td>
<td>5.2</td>
<td>4.7</td>
<td>0.13</td>
<td>*</td>
</tr>
</tbody>
</table>
## Effect of forage on performance

<table>
<thead>
<tr>
<th>Silage</th>
<th>Medium</th>
<th>High</th>
<th>Maize</th>
<th>s.e.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME intake (MJ/d)</td>
<td>15.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>15.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.6&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.19</td>
</tr>
<tr>
<td>Carcass gain - (g/d)</td>
<td>65&lt;sup&gt;a&lt;/sup&gt;</td>
<td>86&lt;sup&gt;b&lt;/sup&gt;</td>
<td>93&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.5</td>
</tr>
<tr>
<td>- (g/MJ MEI)</td>
<td>4.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Effect of treatment on forage DM intake

Contrasts
MFVS v HFVS Sig P=0.053
MS v GS *
Effect of treatment on total DM intake

Contrasts
MFVS v HFVS  Sig  P=0.056
MS v GS *
Effect of treatment on carcass gain

Contrasts
MFVS v HFVS  Sig  P=0.06
MS v GS **
Effect of treatment on efficiency of utilisation of ME

- b = 2.5
- b = 3.1
- b = 4.8

Contrasts:
- MFVS v HFVS **
- MS v GS **
Effect of treatment on blood urea concentration

Concentrate (kg/d)

Urea (m mol/l)

b = 0.8
b = 1.7
b = 2.2

Contrasts
MFVS v HFVS
MS v GS

Sig
*
**
Effect of forage on concentrate sparing effect
Effect of forage on concentrate sparing effect

![Graph showing the effect of forage on concentrate sparing](image-url)
Conclusions

◆ A wide range of dietary treatments, thus ME intake, offered in present study
◆ No interactions between dietary and shearing treatments
◆ Shearing lambs at housing increased food intake but had no beneficial effects on lamb performance
◆ Response to concentrate depended on forage type and feed value
Conclusions II

- Whilst the response to forage feed value declines as concentrate feed level increases, there is still a benefit to high feed value forage when it accounts for as low as 37% of the TDMI.

- Reducing concentrate protein concentration did not alter lamb performance.

- Maize silage resulted in the highest level of lamb performance due to its higher intake characteristics.