Supplementation for the grazing cow: corn and alternatives

Brad Heins
West Central Research and Outreach Center Morris, MN

Why supplement cattle consuming forage based rations?

• Improve animal performance
• Stretch forage supply
• Improve profitability

Factors affecting supplementation

• Composition of cool-season pastures
• Dry matter intake of cows on pasture
• Pasture protein
• Economics

Factors affecting pasture DMI

• Nutrient requirements of cattle
• Enlargement of the digestive tract
• Grazing behavior
• Pre-grazing pasture mass
• Amount of pasture offered per cow

Calculating DMI

• It is important for DMI to be actually measured or accurately estimated
  • proper diet formulation
  • prevent underfeeding or overfeeding
  • promote efficient nutrient use
• Calculate by direct measure of pastures or use the subtraction method
Grazing behavior
• Increasing concentrate amount reduces grazing time
• Supplementation of 17 lb. of corn reducing grazing time by 75 to 104 minutes per day (Bargo, 2002)
• Average grazing time is 580 minutes/day for un-supplemented cows
• Grazing time reduced by 12 min/d for every kg of concentrate

Pasture protein
• Crude protein intake is good if capture in rumen
• Fermentable carbohydrates drive microbial growth in rumen
• Corn increases microbial yield by 1.4 fold
• Excess ammonia may costs energy (3 to 6 lb of milk) and affect reproduction

Substitution rate
• For each unit of grain fed, pasture dry matter intake decreases 0.5 to 0.8 lb (Muller, 1998)
• With more grain, total dry matter intake will likely increase
• Feeding more grain extends supply of pasture

Supplementation summary

Carl Polan, Virginia Tech
When I need to supplement, does it matter what I supplement?

Grain feeding guidelines

<table>
<thead>
<tr>
<th>4% FCM</th>
<th>Spring</th>
<th>Summer</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (lb/day)</td>
<td>lb</td>
<td>G/M</td>
<td>lb</td>
</tr>
<tr>
<td>&lt;80</td>
<td>20</td>
<td>1.4 to 1.5</td>
<td>25-27</td>
</tr>
<tr>
<td>70</td>
<td>16-18</td>
<td>1.4 to 1.5</td>
<td>21-25</td>
</tr>
<tr>
<td>60</td>
<td>12-14</td>
<td>1.5</td>
<td>15-18</td>
</tr>
<tr>
<td>50</td>
<td>8-10</td>
<td>1.5 to 1.6</td>
<td>10-12</td>
</tr>
<tr>
<td>&gt;40</td>
<td>6-8</td>
<td>1.6 to 1.7</td>
<td>8-10</td>
</tr>
</tbody>
</table>

Muller, 1998

Expected Milk Response

Table 1. Expected milk yield response of high-producing cows to increasing increments of concentrate feeding.

<table>
<thead>
<tr>
<th>Supplemental concentrate fed (lb)</th>
<th>Expected lb milk/lb additional lb of concentrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>1.2 to 1.3</td>
</tr>
<tr>
<td>4-8</td>
<td>1.0 to 1.2</td>
</tr>
<tr>
<td>8-12</td>
<td>0.8 to 1.0</td>
</tr>
<tr>
<td>12-16</td>
<td>0.65 to 0.8</td>
</tr>
<tr>
<td>16-20</td>
<td>0.4 to 0.65</td>
</tr>
</tbody>
</table>

Muller, 1998

Alternative feeds

• High quality forage (40% NDF, 20% starch)
• Grains with similar carbohydrates to corn
• High sugars in ration (5% sugar in ration)
• Molasses
• Use more corn silage, if available

CROPP, “Ask the experts”, September 2011
Alternative feeds

- Barley (95% energy of corn, high fiber)
- Oats (90% energy of barley, higher fiber)
- Wheat (high protein, energy similar to corn)
- Peas (similar energy to wheat)

Replacing corn

- Monitor milk production
- Watch protein test
- High MUN (milk urea nitrogen)
- High levels can affect health and fertility
- Observe manure and body condition

Forage supplement

- Forage supplements decrease pasture dry matter intake more than concentrates
- Fodder systems???

Molasses

- Primary energy source on some organic dairies

Molasses results

- Pasture intake and total DMI was higher for cows fed molasses vs. corn meal
- No differences observed in milk production
  - 28.2 lb (molasses) vs. 26.0 lb (corn meal)
- Milk components were similar
- Reduced MUN in cows fed molasses
- Economics???
California State-Chico research

Low versus high supplementation

<table>
<thead>
<tr>
<th>Trait</th>
<th>Low Supplement</th>
<th>High Supplement</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>36</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Milk (lb)</td>
<td>48</td>
<td>51</td>
<td>-3</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>3.7</td>
<td>3.8</td>
<td>-0.1</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>3.3</td>
<td>3.2</td>
<td>+0.1</td>
</tr>
<tr>
<td>SCC (1,000s)</td>
<td>127</td>
<td>134</td>
<td>-7</td>
</tr>
<tr>
<td>SCS</td>
<td>3.10</td>
<td>3.26</td>
<td>+0.16</td>
</tr>
</tbody>
</table>

No significant difference between low or high supplemented cows

Low versus high supplementation

<table>
<thead>
<tr>
<th>Trait</th>
<th>Low Supplement</th>
<th>High Supplement</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>36</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Grain intake (lb)</td>
<td>5.3</td>
<td>10.6</td>
<td>-4.7</td>
</tr>
<tr>
<td>Pasture intake (lb)</td>
<td>25.3</td>
<td>20.0</td>
<td>+5.3</td>
</tr>
<tr>
<td>Grain ($/cow/d)</td>
<td>1.27</td>
<td>2.00</td>
<td>+0.73</td>
</tr>
<tr>
<td>Pasture ($/cow/d)</td>
<td>2.03</td>
<td>1.60</td>
<td>+0.43</td>
</tr>
<tr>
<td>Feed cost/cwt ($)</td>
<td>9.72</td>
<td>10.64</td>
<td>-0.92</td>
</tr>
<tr>
<td>CFIC ($)</td>
<td>7.43</td>
<td>6.91</td>
<td>+0.52</td>
</tr>
</tbody>
</table>

California State University – Chico organic dairy

Conclusions

- Grazing cows are limited in milk production by insufficient feed intake
- 1 pound of grain per 4 lb of milk
- Economics will drive supplementation level and what is supplemented