The Right Forages for Dairy Heifers
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Some Thoughts About Forage Quality
Forage quality is highly dependent on climate, forage type, harvest management, and many other factors.
Maturity

Alfalfa

<table>
<thead>
<tr>
<th></th>
<th>Kd, /h</th>
<th>12-h Dig</th>
<th>24-h Dig</th>
<th>48-h Dig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Bloom</td>
<td>.13</td>
<td>58.9</td>
<td>64.4</td>
<td>65.8</td>
</tr>
<tr>
<td>Bud</td>
<td>.16</td>
<td>65.2</td>
<td>69.9</td>
<td>70.7</td>
</tr>
<tr>
<td>Veg</td>
<td>.15</td>
<td>77.8</td>
<td>83.0</td>
<td>84.0</td>
</tr>
</tbody>
</table>

Sources: Hoffman et al., 1993

Orchardgrass

<table>
<thead>
<tr>
<th></th>
<th>Kd, /h</th>
<th>12-h Dig</th>
<th>24-h Dig</th>
<th>48-h Dig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Head</td>
<td>.07</td>
<td>54.2</td>
<td>65.2</td>
<td>72.0</td>
</tr>
<tr>
<td>Boot</td>
<td>.08</td>
<td>63.2</td>
<td>74.4</td>
<td>80.3</td>
</tr>
<tr>
<td>2nd Node</td>
<td>.10</td>
<td>71.4</td>
<td>81.1</td>
<td>84.9</td>
</tr>
</tbody>
</table>

Sources: Hoffman et al., 1993
**Sources:** Hoffman et al., 1993; Ogden et al. (2005)
Sources: Hoffman et al., 1993; Galdamez-Cabrera et al., 2003; Ogden et al., 2003.
IVDMD vs. Maturity (Alfalfa)

Adapted from Van Soest, 1982
IVDMD vs. Maturity (Van Soest, 1982)

Adapted from Van Soest, 1982
### Effective Degradability of NDF

The table below presents the effective degradability of neutral detergent fiber (NDF) for different plant species, considering a 6%/h passage rate.

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>NDF, %</th>
<th>Kd, /h</th>
<th>NDFD*, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa, 10% Bloom</td>
<td>40.9</td>
<td>0.08</td>
<td>32.3</td>
</tr>
<tr>
<td>Eastern Gamagrass, Mature</td>
<td>78.0</td>
<td>0.03</td>
<td>26.3</td>
</tr>
</tbody>
</table>

*Effective degradability of NDF calculated on the basis of a 6%/h passage rate.*
**Alfalfa - Maturity (NDF)**

<table>
<thead>
<tr>
<th></th>
<th>NDF, %</th>
<th>Kd, /h</th>
<th>NDFD*, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midbloom</td>
<td>47.3</td>
<td>0.07</td>
<td>28.6</td>
</tr>
<tr>
<td>Bud</td>
<td>42.6</td>
<td>0.09</td>
<td>32.0</td>
</tr>
<tr>
<td>Veg</td>
<td>31.0</td>
<td>0.11</td>
<td>47.9</td>
</tr>
</tbody>
</table>

Source: Hoffman et al. (1993)

**Alfalfa - Plant Part (NDF)**

<table>
<thead>
<tr>
<th></th>
<th>NDF, %</th>
<th>Kd, /h</th>
<th>NDFD*, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem</td>
<td>59.4</td>
<td>0.05</td>
<td>20.2</td>
</tr>
<tr>
<td>Wholeplant</td>
<td>40.9</td>
<td>0.08</td>
<td>32.3</td>
</tr>
<tr>
<td>Leaf</td>
<td>25.4</td>
<td>0.09</td>
<td>47.7</td>
</tr>
</tbody>
</table>

Source: Coblentz et al. (1998)

*Passage rate = 6%/h
A discussion of appropriate forage quality (*the right forage*) is highly dependent on what you intend to feed.
Assuming this is a 1200-lb (pregnant, nonlactating) beef cow wandering aimlessly in the Ozarks, the required energy density of her diet should be about 47.1% TDN.
Relationship between TDN and NDF (NRC, 2001)

Legume

\[ Y = 0.016x^2 - 1.93x + 112.5 \]

\[ R^2 = 0.978 \]

Cool-Season Grass

\[ Y = 0.012x^2 - 1.86x + 125.5 \]

\[ R^2 = 0.991 \]
Within this context …….,
maturing forages are not
necessarily a problem, and
in many cases actually may be desirable.

The “right forage” may not be the one with the best or highest quality.
Effects of Maturity on Alfalfa Yield and NDF

- mean of eight harvests of ‘Affinity’ alfalfa over two years (2004-2005)
- increase of 92 lbs DM/acre/d following Stage 2
- results in improved harvest efficiency and (possibly) fewer harvests.

- linear increase of NDF (0.4 percentage units/day), plus an associated reduction of TDN (0.25 percentage units/d) following Stage 2
Relationship between CP and NDF (NRC, 2001)

- **Legume**
  
  \[ Y = 0.017x^2 - 1.86x + 69.2 \]
  
  \[ R^2 = 0.962 \]

- **Cool-Season Grass**
  
  \[ Y = 0.043x^2 - 5.53x + 189.1 \]
  
  \[ R^2 = 0.959 \]

- **Corn Silage**

  - 300 lbs
  - 600 lbs
  - 1200 lbs
  - 900 lbs
Increased maturity also results in lower CP and rumen degradable protein (RDP), both of which are desirable generally for dairy heifers.
A Practical Application
Many commercial dairy heifer growers would like to maximize the use of corn silage and by-products of the ethanol industry in the diets of replacement heifers.

- This has created the need for ‘cutter’ forages that (ideally) exhibit:
  - high DM yield
  - high fiber (~ 70% NDF)
  - low energy (45 – 50% TDN)
  - high protein (~ 15% CP)
  - low K (~ 1.5%)
### Energy Requirement, TDN

<table>
<thead>
<tr>
<th>Bodyweight, lbs</th>
<th>Energy Requirement, TDN</th>
<th>Corn Silage (72% TDN)</th>
<th>Alfalfa Silage (60% TDN)</th>
<th>Cutter Forage (48% TDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>68.0</td>
<td>50</td>
<td>50</td>
<td>Grain</td>
</tr>
<tr>
<td>600</td>
<td>66.0</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>900</td>
<td>63.3</td>
<td>43</td>
<td>43</td>
<td>15</td>
</tr>
<tr>
<td>1200</td>
<td>62.3</td>
<td>39</td>
<td>39</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: P. C. Hoffman, University of Wisconsin
Synchrony of Forage and Livestock Needs

1) delayed harvest schedules
2) comparisons of straws
3) tropical corn
4) perennial warm-season grasses

Source: P.C. Hoffman, University of Wisconsin
All of these forages might be the "right forage", it just depends.
Final Thoughts

- Alfalfa and corn silage tend to complement each other in heifer diets, and often do not allow for incorporation of other low-cost nutrients, especially those with relatively high energy densities.

- Use of significant proportions of corn silage may necessitate limit feeding or the use of an ‘energy diluting’ forage.
Final Thoughts

• Producers might consider being proactive in their harvest management of legumes and grasses – “dairy quality” is not necessarily helpful.

• Avoid being “boxed in”, where you have only “dairy quality” or low-energy forages available.

• Routinely test forages and have ration balanced (energy, protein) based on appropriate heifer size/weight.