Use of “New Generation” DDGS in Ruminant Diets

Dr. A. DiCostanzo
Department of Animal Science
University of Minnesota, St. Paul
# Nutrient Composition

<table>
<thead>
<tr>
<th>Item</th>
<th>% of DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein</td>
<td>28 to 36</td>
</tr>
<tr>
<td>RUP, % of CP</td>
<td>47 to 63</td>
</tr>
<tr>
<td>NEI, Mcal/kg</td>
<td>2.20</td>
</tr>
<tr>
<td>Fat</td>
<td>8.2 to 11.7</td>
</tr>
<tr>
<td>ADF</td>
<td>19 to 24</td>
</tr>
<tr>
<td>NDF</td>
<td>38 to 44</td>
</tr>
<tr>
<td>Ca</td>
<td>0.10 to 0.15</td>
</tr>
<tr>
<td>P</td>
<td>0.43 to 0.83</td>
</tr>
</tbody>
</table>

High-bypass potential with >80% SI digestion

NDF
As effective as Alfalfa haylage
Only 68% as effective as Corn silage
Handling that causes particle separation will result in considerable variation of DDG or DDGS composition.

Akayezu et al., 1998

Fine particles (< 1 mm) represented 58% of the sample weight on average across 8 ethanol production facilities (CV 20.6%).

Harty et al., 1998
Amino Acid Profile

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>% DM 1993</th>
<th>% DM 1996</th>
<th>% DM 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lys</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Met</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>His</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
When ADIN > 13% N lightness correlated with ADIN and IARUP.
Owen and Larson, 1991
(Ammoniated corn silage 50% diet DM)
Owen and Larson, 1991
(Ammoniated corn silage 50% diet DM)
Grings et al., 1992
(Alfalfa 39% diet DM)

Treatment

Lo CP 0  Lo CP 10  Md CP 21  Md CP 32

Milk or DMI, lb/d

DMI

Milk

0 10 20 30 40 50 60 70 80 90 100
Powers et al., 1995
(Corn silage 50% diet DM)
Powers et al., 1995
(Corn silage 50% diet DM)

Milk fat or protein, %

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fat</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo CP 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo CP 131</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo CP 132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo CP 133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Md CP 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Md CP 261</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Md CP 262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Md CP 263</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Staples et al., 1995
(corn silage 30%, 45%, 60% diet DM)
Recommendations

- Research suggests DDGS can comprise between 20% and 26% of the diet DM
  - Limiting factors: CP, RUP and lysine content
    - Balance for RUP, RDP, CP and lysine
    - Limit CP coming from corn sources to less than 60% of total CP
      - Corn grain, silage, DDGS, gluten meal, gluten feed
- DDGS replaces forage NDF at 66% effectiveness
  - For every 1 lb forage replaced, use 1.5 lb NDF from DDGS
DDGS Research in Ruminants

NCR-88 Beef Growing-Finishing Systems

• Summarized studies in 1984 (NCR No. 297)
  ✓ Characterization of fermentation by-products
    – Higher protein concentration than corn
    – Similar or greater RUP
    – Similar energy concentration as corn
  ✓ DDGS as a protein source
    – Replacement for other protein sources
      » When combined with urea of equal value as SBM
    – As a bypass source
      » Fortified with urea > urea alone
      » More efficient protein source when combined with urea than SBM
  ✓ DDGS as an energy source
    – “if abundant supplies of wet distillers’ grains should become available—as a result, for example, of increased production of fuel alcohol—this by-product could be used as an energy source in livestock feeds.”
Beef Feedlot Research

- Focus of most of the DDGS and WDGS work
  - No complications with composition of gain
  - Typically require lower fiber and CP concentrations

- Variable
  - Crude protein sources
  - Crude protein concentrations
  - Age and/or weight at feedlot entry
Research

- Data from studies conducted since 1990
- 264 pens housing 1,541 head of cattle
- 796 lb (361 kg) initial weight
- NE, IA, KS, SD
DDGS and CP on FTG

- 12% CP
- 13% CP
- 14% CP

Graph showing the relationship between DDGS and FTG for different CP levels.
Protein Source and WDG on ADG

ADG, lb/d vs. WDGS

- 12% w SBM
- 13% w SBM
- 12% w Urea
- 13% w Urea
Protein Source and WDGS on FTG

- 12% w SBM
- 13% w SBM
- 12% w Urea
- 13% w Urea
Recommendations

- Feed between 25% and 30% DDGS for enhanced gain
- Intake response is linear, and greater at lower dietary CP
- Feed 10% DDGS for enhanced feed conversion
- Feed conversion response is greater at lower dietary CP