USING DISTILLERS GRAINS IN DAIRY RATIONS

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University of Minnesota
St. Paul, MN

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Cornell University
Ithaca, NY
### Projected Distillers Grains Production

**Minnesota - 6 to 11 plants**

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (1,000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>135</td>
</tr>
<tr>
<td>1997</td>
<td>319</td>
</tr>
<tr>
<td>1998</td>
<td>431</td>
</tr>
<tr>
<td>1999</td>
<td>454</td>
</tr>
</tbody>
</table>
DISTILLERS GRAINS PRODUCTION

GRAIN

PROCESSED GROUND

MIXING TANK

Water & Heat

Fermentation

DISTILLATION

Yeast

Alcohol

Solid Separation

Unfermented Grains

Heat

DRIED DISTILLERS GRAINS (DDG)

Thin Stillage

Heat

CONDENSED DISTILLERS SOLUBLES (CDS)

Heat

DRIED DISTILLERS SOLUBLES (DDS)

DRIED DISTILLERS GRAINS with SOLUBLES (DDGS)
## Nutrient Composition of Corn-Based Distillers Grains

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>DDG</th>
<th>CDS</th>
<th>DDGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP, %</td>
<td>23</td>
<td>30</td>
<td>25 (22-33)&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>UIP, % CP</td>
<td>54</td>
<td></td>
<td>47 (45-55)</td>
</tr>
<tr>
<td>SIP, % CP</td>
<td></td>
<td></td>
<td>15 (5-28)</td>
</tr>
<tr>
<td>ADF, %</td>
<td>17</td>
<td>7</td>
<td>18 (10-25)</td>
</tr>
<tr>
<td>NDF, %</td>
<td>43</td>
<td>23</td>
<td>44 (29-50)</td>
</tr>
<tr>
<td>Fat, %</td>
<td>10</td>
<td>9</td>
<td>10 (2-20)</td>
</tr>
<tr>
<td>NE&lt;sub&gt;L&lt;/sub&gt;, Mcal/lb</td>
<td>.9</td>
<td>.93</td>
<td>.93</td>
</tr>
</tbody>
</table>

<sup>1</sup> DM basis.

<sup>2</sup> Ranges reported in literature.
SOURCES OF NUTRIENT VARIATION

✓ Grain source - Corn, Barley, Wheat, Milo

✓ Grain quality

✓ Production factors
  - Grain processing - particle size
  - Fermentation - extent
  - Separation - solids and liquids
  - Drying temperatures

✓ Blending - Grains and Solubles
DISTILLERS GRAINS CHARACTERISTICS

• Generally 3X nutrient content of original grain
• Low in starch
• High fat
• High protein
• High fiber
• High phosphorus
PROTEIN QUALITY IN DISTILLERS GRAINS

• Heat Damaged Protein
  - ADIN - Indicator and measure of 11 to 32% CP range
  - <20% of CP desirable
  - Some ADIN digested postruminally

• Indicators of Heat Damaged Protein
  - Reduced animal performance
  - Lowered milk protein percentage
  - Color of distillers grains
    - Low - honey golden
    - High - dark brown to black

• Amino Acid Content
  - Similar to whole grain before fermenting
  - Generally low lysine
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  - Generally low lysine
1. Price/lb of CP

\[
$/\text{lb of CP} = \frac{\$/\text{unit of feed}}{(\text{unit of feed} \times \text{DM} \times \text{CP})} = \frac{\$150/\text{ton}}{2000 \text{ lb} \times 92\% \times 28\%} = .29
\]

2. Price - Energy (corn) and Protein (SBM) basis

\[
$/\text{cwt of DDGS} = (\$/\text{cwt of corn} \times .531) + (\$/\text{cwt SBM} \times .514) = (7.14 \times .531) + (12.50 \times .514) = $10.22/\text{cwt}
\]

3. Comparable ingredient blend - 25% CP, 86 Mcal NE\text{L}

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<thead>
<tr>
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<th>lb/100 lb</th>
<th>$/lb</th>
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<tr>
<td>SBM</td>
<td>47.5</td>
<td>.1250</td>
<td>5.94</td>
</tr>
<tr>
<td>Corn</td>
<td>46.0</td>
<td>.0714</td>
<td>3.28</td>
</tr>
<tr>
<td>Tallow</td>
<td>6.5</td>
<td>.25</td>
<td>1.62</td>
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\[
\text{DDGS} = $10.84/\text{cwt}
\]
1. Price/lb of CP

$/lb of CP

= $/unit of feed / (unit of feed x DM x CP)

= $150/ton / 2000 lb x 92% x 28%

= .29
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= ($/cwt of corn x .531) + ($/cwt SBM x .514)

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<tr>
<td><strong>100% Alfalfa</strong></td>
<td></td>
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<tr>
<td>Peptides, g</td>
<td>-22</td>
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<td>+24</td>
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<tr>
<td>Met, %EAA</td>
<td>5.0</td>
<td>5.0</td>
<td>4.8</td>
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<td>Lys, %EAA</td>
<td>14.1</td>
<td>13.2</td>
<td>12.4</td>
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Rations - 8 lb CGF, .25 blood meal, corn and soybean meal
# 80 lb MILK EXAMPLE RATIONS

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FEEDING RECOMMENDATIONS

DISTILLERS GRAINS

- Maximum amount - 26% of diet DM
- Limit amount of CP from corn products to <60% of total CP
- Lysine will be limiting in many rations
- Feed DDGS in combination with other protein sources
- Balance CP, DIP, SIP
- Effective NDF content of distillers grains is limited
  - Replaces corn-soybean meal, NOT forage in rations
Milk Production
DDGS with Corn Silage

Powers et al., 1995
Milk Production
DDGS with Alfalfa

Grings et al., 1992