The Value of DDGS in Swine Feeding Programs

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DDGS Production and Use

- 3.2 to 3.5 million metric tonnes (MT) of DDGS are produced in North America/year
  - ~ 900,000 MT produced in MN-Dakota region
  - ~ 700,000 MT exported to the EU
  - ~ 2.65 million MT fed in U.S. and Canada
    - ~ 2.58 million MT (80%) fed to ruminants
    - ~ 45,000 MT fed in MN turkey industry
    - < 27,000 MT used in swine diets
Distribution of Use of DDGS Produced in North America

- Ruminants
- MN Turkey
- Swine
- Exported to EU
Why Hasn’t DDGS Been Used in Swine Diets?

- Variability of nutrient levels
  - type of grain used
  - variability of corn quality
  - amount of solubles added

- Low amino acid digestibility
  - variable heating and drying temperatures
  - excessive heating = dark color

- High crude fiber
  - low and variable DE and ME estimates
Why Hasn’t DDGS Been Used in Swine Diets?

- **Amino Acid Profile**
  - amino acid balance not well suited to the pig
    - low lysine
  - amino acid imbalance is amplified 3 fold in DDGS vs corn

- Limited recent information on use of DDGS in swine diets

- Cost competitiveness relative to commonly used energy and amino acid ingredients
Why is There Renewed Interest in Feeding DDGS to Swine?

- Increasing quantities of DDGS
  - increased ethanol production to meet oxygenated fuel demand
- New ethanol plants
  - improved fermentation technology and processing = higher feeding value?
- Reduced nutrient variability?
  - corn supply from smaller geographic regions
- Higher P availability = reduced P excretion in manure
- Reduced odor emissions?
How Do Nutrient Levels of MNSD DDGS Compare to Published Values?
MNSD DDGS has Higher Nutrient Levels and Digestibility than Other DDGS Sources

- Energy
  - Digestible energy (DE) and metabolizable energy (ME) > corn
  - Increase in fiber content is offset with increase in fat content

- Amino acids
  - Poor amino acid balance
  - Higher digestible amino acids levels
MNSD DDGS Metabolizable Energy (kcal/ kg) vs. DDGS from an Older Midwestern Plant and Published Values

C.V. = 34.0

Estimated ME, kcal/kg

- MNSD
- MW
- NRC
- HL
- FDST

C.V. = 34.0
# MNSD DDGS Apparent Digestible Amino Acid Levels vs. DDGS from an Older Midwestern Plant and Published Values

<table>
<thead>
<tr>
<th>App. Dig. AA</th>
<th>MNSD</th>
<th>MW</th>
<th>NRC (1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine, %</td>
<td>.44</td>
<td>.00</td>
<td>.31</td>
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<tr>
<td>Methionine, %</td>
<td>.32</td>
<td>.24</td>
<td>.39</td>
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<tr>
<td>Threonine, %</td>
<td>.62</td>
<td>.36</td>
<td>.56</td>
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<tr>
<td>Tryptophan, %</td>
<td>.15</td>
<td>.15</td>
<td>.14</td>
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<tr>
<td>Valine, %</td>
<td>.92</td>
<td>.51</td>
<td>.88</td>
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</tbody>
</table>
MNSD DDGS is Higher in Phosphorus Availability Compared to Corn and Published Values

- Available P in DDGS is dramatically improved compared to corn (0.80% vs 0.04%).

- Available P in MNSD DDGS is higher than published values (0.80% vs. 0.59%)
MNSD DDGS Available Phosphorus Levels vs. Published Values

% Available P

MNSD

NRC

[Bar chart showing the comparison between MNSD and NRC available phosphorus levels]
DDGS is Often an Economical Addition to Swine Diets

- Replaces a portion of:
  - Corn
  - Soybean meal
  - Dicalcium phosphate
What Are the Effects of DDGS on Manure Nutrient Management and Air Quality?
Effects of DDGS on Manure Nitrogen Excretion

THE BAD NEWS

- Manure N content increases due to:
  - high crude protein:lysine ratio
  - reduced a.a. digestibility compared to corn & SBM
- Excess N minimized by adding synthetic amino acids to diets
- High levels of DDGS may reduce pig performance due to the energy cost of removing excess N
- May increase ammonia emissions?
Effects of DDGS on Manure Phosphorus Excretion

- THE GOOD NEWS
  - Manure P content is reduced due to:
    - DDGS has more available P compared to corn and soybean meal
    - Amount of supplemental inorganic P or phytase in the diet is decreased.
  - Decreased diet cost
Effects of DDGS on Air Quality

- Feeding DDGS has no positive or negative effects on gas and odor emissions.
Effect of Dietary Treatment on Manure Odor Detection Threshold

MSE ± .1152  P > .10
Effect of Dietary Treatment on Ammonia Emission

![Graph showing the effect of dietary treatment on ammonia emission. The graph plots NH$_3$ (ppm) against week. The control group is represented by red squares, and the DDGS group is represented by blue diamonds. The MSE is ±0.0876, and the P value is greater than 0.10.]
Effect of Dietary Treatment on Hydrogen Sulfide Emission

![Graph showing the effect of dietary treatment on hydrogen sulfide emission. The x-axis represents weeks, and the y-axis represents H₂S (ppm). The graph compares Control and DDGS treatments. The MSE is ±0.0426, and P > 0.10.](image)
Recommended Usage Rates of DDGS in Swine Diets

- Nursery pigs – up to 5%
- Grow-finish pigs – up to 20%
- Gestating sows – up to 50%
- Lactating sows – up to 20%
Summary

- MNSD DDGS:
  - has higher levels and digestibility of most key nutrients
  - has less variability in nutrient levels
  - does not reduce or improve air quality
  - will reduce P excretion
  - is often can be an economical addition to swine diets
Evaluation of the Feeding Value of MNSD DDGS

- Ethanol plants participating in DDGS evaluation:
  - Aberdeen, SD
  - Bingham Lake, MN
  - Luverne, MN
  - Preston, MN
  - Winnebago, MN
  - Benson, MN
  - Claremont, MN
  - Morris, MN
  - Scotland, SD
  - Winthrop, MN