The Value of Midwestern Produced DDGS in Swine Diets

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3.2 to 3.5 million metric tonnes 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
  - ~ 2,580,000 MT (80%) fed to ruminants
  - ~ 45,000 MT fed in MN turkey industry
  - ~ 30,000 MT used in swine diets
The Minnesota Ethanol Industry

- 14 plants:
  - Use 130 million bu. of corn
    - 13% of MN corn production
  - Produce 240 million gallons of ethanol
  - Produce 1 million tons of DDGS
    - 30% of total DDGS in North America

- Plants are:
  - Small - 13 to 34 million gallon capacity/year
  - New - < 10 years old
  - Farmer owned - 8,945 farmer members
Why Hasn’t DDGS Been Used in Swine Diets?

- Low protein quality
- Low amino acid digestibility
- High fiber content
- Nutrient variability among sources
- Cost competitiveness with corn and soybean meal
- Image that DDGS is an inferior ingredient
Why is There Renewed Interest in Feeding DDGS to Swine?

Rapid growth of the ethanol industry has increased the quantity and local supply
- 24 million gallons of ethanol produced in 1994
- 220 million gallons produced in 2000

New ethanol plants are producing higher quality DDGS
- Higher nutrient content and digestibility than NRC (1998)

A cost effective partial replacement for corn, SBM and dicalcium phosphate
Why is There Renewed Interest in Feeding DDGS to Swine?

- Use reduces phosphorus content of manure
- Appears to improve gut health of grow-finish pigs
Quality Considerations for Selecting DDGS Sources

- Golden color DDGS is much better suited for swine diets than darker colored DDGS due to higher amino acid digestibility.

- DDGS produced by new Midwestern plants is higher in nutrient content and digestibility than DDGS from older plants.
Quality Considerations for Selecting DDGS Sources

- Nutrient Specifications
  - Moisture – maximum 12%
  - Protein – minimum 26.5%
  - Fat – minimum 10%
  - Fiber – maximum 7.5%
Quality Considerations for Selecting DDGS Sources

- Physical characteristics
  - Bulk density – 34 to 37 lb/cubic foot
  - Particle size:
    - maximum coarse particles - 10% on 2000 screen
    - maximum fine particles - 15% on 600 screen & in pan
  - Smell – fresh, fermented
  - Color – goldenrod
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
<table>
<thead>
<tr>
<th>App. Dig. AA</th>
<th>MNSD</th>
<th>MW</th>
<th>NRC (1998)</th>
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<tbody>
<tr>
<td>Lysine, %</td>
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<tr>
<td>Methionine, %</td>
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<td>Threonine, %</td>
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<td>.15</td>
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<td>.14</td>
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<tr>
<td>Valine, %</td>
<td>.92</td>
<td>.51</td>
<td>.88</td>
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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
DDGS is Often an Economical Addition to Swine Diets

- 200 lbs of DDGS and 3 lbs of limestone replaces:
  - 177 lbs of corn
  - 20 lbs of soybean meal (44%)
  - 6 lbs of dicalcium phosphate
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%
DDGS in Grow-Finish Diets

- Formulate on a digestible amino acid basis to optimize performance.
- No effect on carcass or meat quality when fed up to 30% of the diet.
- Reduces belly thickness, firmness, and increases fat softness.
- Appears to help alleviate gut health problems.
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
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 compares Control and DDGS groups over 9 weeks, with MSE ± .0876 and P > .10.](image-url)
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 H$_2$S (ppm). The graph compares Control (red line) and DDGS (blue line) treatments. The MSE is ±0.0426 and P > 0.10.](image-url)
Conclusion

- DDGS produced in MN and SD ethanol plants is:
  - higher quality than other sources
  - often a cost effective replacement for corn, soybean meal and dicalcium phosphate
  - abundant quantities are available locally
  - effective in minimizing P excretion in manure
  - may improve gut health of grow-finish pigs
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