Use of “New Generation” Corn DDGS in Feeds for Swine, Poultry, and Aquaculture

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Overview – Part 2

- Recommended maximum inclusion rates of “new generation” DDGS in swine diets
- Nursery feeding trial results
- Highlights of grow-finish feeding trial
- Highlights of gestation-lactation feeding trial
- Effects of DDGS and phytase on reducing dietary inorganic P supplementation and manure P levels
- Effects of feeding diets containing DDGS on manure gas and odor emissions
- U of M DDGS web site
- New corn distiller’s feed ingredients

Why is there so much interest in feeding DDGS to swine?

- “New Generation” DDGS is high in digestible nutrients
- Economical partial replacement for:
  - corn
  - soybean meal
  - dicalcium phosphate
- Increasing production and supply
- Unique properties
  - reduce P excretion in manure
  - increase litter size weaned/sow
  - gut health benefits?

Maximum Inclusion Rates of “New Generation” DDGS in Swine Diets
(Based Upon University of Minnesota Performance Trials)

- Nursery pigs (> 7 kg)
  - Up to 25%
- Grow-finish pigs
  - Up to 20% (higher levels may reduce pork fat quality)
- Gestating sows
  - Up to 50%
- Lactating sows
  - Up to 20%

Assumptions: no mycotoxins
Formulate on a digestible amino acid and available phosphorus basis

Feeding “New Generation” DDGS to Weaned Pigs

Materials and Methods – Nursery Experiments

- Experiment 1
  - Pigs weaned at 19.0 ± 0.3 d of age
  - Weighed 7.10 ± 0.07 kg
- Experiment 2
  - Pigs weaned at 16.9 ± 0.4 d of age
  - Weighed 5.26 ± 0.07 kg
  - Pigs were fed a commercial pelleted diet (d 0 to 3 postweaning)
- Phase II (d 4-17) and Phase III (d 18 – 35) diets were formulated on a digestible amino acid basis.
  - Diets contained 0, 5, 10, 15, 20, or 25% DDGS
Effect of DDGS Level on Growth Rate (Experiment 1)

Means not sharing a common superscript letter are significantly different (P < .05)

Effect of DDGS Level on ADFI (Experiment 1)

Effect of DDGS Level on Gain/Feed (Experiment 1)

Effect of DDGS Level on Growth Rate (Experiment 2)

Effect of DDGS Level on Feed Intake (Experiment 2)

Effect of DDGS Level on Gain/Feed (Experiment 2)

Means not sharing a common superscript letter are significantly different (P < .05)
Effect of DDGS Level on Final BW (Experiment 2)

Feeding “New Generation” DDGS to Grow-Finish Pigs

Materials and Methods

- 240 crossbred pigs (approx. 28.3 kg BW)
  - Grow-finish facilities at WCROC – Morris, MN
  - Blocked by weight, gender and litter
  - Blocks randomly assigned to 1 of 4 diet sequences
    - 5-phase feeding program
  - 0, 10, 20, or 30% DDGS diets formulated on total lysine basis
  - 24 pens, 10 pigs/pen, 6 replications/trt

Fat Quality Characteristics of Market Pigs Fed Corn-Soy Diets Containing 0 to 30% DDGS

- Iodine number
- Adjusted belly firmness score, degrees
- Belly thickness, cm

Means within a row lacking common superscripts differ (P < .05).

Feeding “New Generation DDGS to Sows”

Effect of Feeding a 50% DDGS Diet on Sow Weight Gain During Gestation (Reproductive Cycle 1)
Effect of Feeding 0 or 50% DDGS Gestation Diets and 0 or 20% DDGS Lactation Diets on Pigs Weaned/Litter

Does Feeding DDGS Improve Gut Health?

What is Ileitis?
- Porcine Proliferative Enteropathy
  - Caused by *Lawsonia intracellularis*
  - Present in 96% of U.S. swine herds (Bane et al., 1997)
  - 28% of pigs affected (NAHMS, 2000)
  - Can be shed in infected pigs for up to 10 weeks
- Animals are infected by oral contact with feces from animals shedding the bacteria
  - 7-10 days after infection:
    - Lesions of the intestinal wall begin to form
    - Lesions maximized around 21 days post-infection

Clinical Forms of Ileitis
- Porcine Intestinal Adenomatosis (PIA)
  - Chronic form
  - Seen in growing pigs (6 - 20 weeks of age)
  - Decreased feed intake, lethargic
- Porcine Hemorrhagic Enteropathy (PHE)
  - Acute form, affects heavier pigs
    - Greatest frequency appears to be from 65 – 110 kg pigs
  - Massive intestinal hemorrhaging, bloody diarrhea, increase in mortality
Healthy Ileitis

Effect of Dietary Treatment on Lesion Length (21 d Post-Challenge) Experiment 2

Effect of Dietary Treatment on Lesion Severity (21 d Post-Challenge) Experiment 2

Effect of Dietary Treatment on Lesion Prevalence (21 d Post-Challenge) Experiment 2

Effect of Dietary Treatment on Fecal Shedding (PCR Analysis) Experiment 2

Effect of Treatment on *L. intracellularis* Infection (IHC Analysis) Experiment 2

* Effect of disease challenge (P < .01).
Summary of Results, Experiment 2

- Inoculation level was close to goal
- DDGS inclusion (10%) or antimicrobial regimen had a positive effect on the pig's ability to resist an ileitis challenge
- No beneficial additive effects of combining DDGS and BMD®/Aureomycin® regimen

DDGS and Phytase are a Key Part of Manure Phosphorus Management

- Adding 20% DDGS to a corn-soy diet and formulating on an available P basis
  - can reduce manure P by > 12%
- Adding phytase to a corn-soy diet
  - increases P bioavailability from 15% to > 45%
- Lowering dietary P, adding 20% DDGS & phytase
  - can reduce manure P excretion by 40 to 50%

Diet Composition When 18.8% DDGS and Phytase are Added to the Diet

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Corn-SBM-1.5 kg Lysine</th>
<th>18.8% DDGS + Phytase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, kg</td>
<td>798.3</td>
<td>838.3</td>
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<tr>
<td>Soybean meal 48%, kg</td>
<td>170.0</td>
<td>153.4</td>
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<tr>
<td>DDGS, kg</td>
<td>0.0</td>
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<td>Dicalcium phosphate, kg</td>
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<td>9.0</td>
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<tr>
<td>Lysine, kg</td>
<td>7.2</td>
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<td>Salt, kg</td>
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<tr>
<td>L-lysine HCl, kg</td>
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<td>1.5</td>
</tr>
<tr>
<td>VT3 premix, kg</td>
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<td>1.5</td>
</tr>
<tr>
<td>Phytase, 500 FTU/kg</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>TOTAL, kg</td>
<td>1090.0</td>
<td>1000.0</td>
</tr>
</tbody>
</table>

U of M DDGS Web Site

www.ddgs.umn.edu

We have developed a DDGS web site featuring:

* research summaries
  - swine, poultry, dairy, & beef
  - DDGS quality
* presentations given
* links to other DDGS related web sites
* international audiences
Research on the Use of Spray Dried Distiller’s Solubles Fractions in Baby Pig Feeds

Materials and Methods
- Utilized 560 pigs weaned at 18 days of age
  - 10 pigs per pen
  - 8 replications/treatment
  - 7 dietary treatments

- One pig from each pen (total of 56 pigs) was slaughtered at day 10 to determine effects of diet on intestinal morphology

Materials and Methods
- 7 dietary treatments fed from day 0 to 10 post-weaning
  - NC = negative control
  - DS = spray dried distiller’s solubles
    - 15% of the diet
  - YC = spray dried yeast cream
    - 7.5% of the diet
    - replaced animal fat
  - RS = spray dried residual solubles
    - 15% of the diet
  - AB = carbadox
    - 50 g/ton
  - PP = spray dried porcine plasma
    - 6% of the diet
  - PC = spray dried porcine plasma + carbadox
    - 6% PP + 50 g/ton AB

Materials and Methods
- All experimental diets contained:
  - Corn (13 to 36%)
  - Soybean meal 46%
    - 7.5% in PP and PC diets
    - 22.5% in all other diets
  - Lactose (20%)
  - Oat groats (12.5%)
  - Fish meal (11%)
  - Minerals and vitamins to meet or exceed requirements
Materials and Methods

- All experimental diets contained:
  - 3440 Kcal/kg ME
  - 6.2 to 7.48% crude fat
  - 1.6% lysine
  - 0.91% methionine + cystine
  - 1.03% threonine
  - 0.29% tryptophan
  - 0.87% calcium
  - 0.80% phosphorus

- Common phase 2 (days 10 to 21) and phase 3 (days 21 to 42) diets were fed for the remainder of the 6 week-trial.
Villi Measurements from the Upper 25% of the Small Intestine from a Pig Fed the Residual Solubles Diet (10X)

Villi Measurements from the Upper 25% of the Small Intestine from a Pig Fed the Carbadox Diet (10X)