Hybrid rye for gestating and lactating sows

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Feed Ingredient Evaluation

- Chemical Composition
- Nutrient Digestibility
- Animal Performance
- Impact on Product Quality
Amino acids, %

As-is basis.
Starch, %

- Hybrid Rye: 55.7%
- Barley: 51.7%
- Wheat: 57.1%
- Corn: 58.0%
- Sorghum: 62.3%

As-is basis.
<table>
<thead>
<tr>
<th></th>
<th>Total dietary fiber, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid 1</td>
<td>15.2</td>
</tr>
<tr>
<td>Hybrid 2</td>
<td>18.1</td>
</tr>
<tr>
<td>Barley DH</td>
<td>12.8</td>
</tr>
<tr>
<td>Barley</td>
<td>19.0</td>
</tr>
<tr>
<td>Wheat</td>
<td>10.6</td>
</tr>
<tr>
<td>Corn</td>
<td>10.3</td>
</tr>
<tr>
<td>Sorghum</td>
<td>8.0</td>
</tr>
</tbody>
</table>

- **Soluble dietary fiber (SDF)**
- **Insoluble dietary fiber (IDF)**

As-is basis.
Minerals, %

Data are from 2016 crop.

As-is basis.
Total Tract Digestibility
Ileal Digestibility In Pigs
T-Cannula
Installing a Cannula
Ready for collection
Open Cannula
Bag full of Digesta
Amino Acid Digestibility
SID of Lysine, %

- Hybrid 1
- Hybrid 2
- Hybrid 3
- Barley DH
- Wheat
- Corn

$P < 0.05$

Lys

SID of Lysine, %
SID of Methionine, %

P < 0.05
SID of Threonine, %

Hybrid 1  Hybrid 2  Hybrid 3  Barley DH  Wheat  Corn

P < 0.05

SID of Threonine, %
Concentration of digestible AA, %

- **Lys**: Total [Lys] in grain: 0.22
  - Not digested: 0.13
  - Digested: 0.13

- **Met**: Total: 0.22
  - Hybrid Rye: 0.22
  - Corn: 0.06

- **Thr**: Total: 0.22
  - Hybrid Rye: 0.22
  - Corn: 0.05

- **Trp**: Not digested
Phosphorus digestibility
P-digestibility
STTD of P, %

Grain*Phytase $P < 0.001$
Grain $P < 0.001$
Phytase $P < 0.001$
AID of starch, %

<table>
<thead>
<tr>
<th></th>
<th>Hybrid 1</th>
<th>Hybrid 2</th>
<th>Barley</th>
<th>Wheat</th>
<th>Corn</th>
<th>Sorghum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>b</td>
<td>ab</td>
<td>ab</td>
<td>a</td>
<td>ab</td>
<td>ab</td>
</tr>
</tbody>
</table>

P < 0.05

I ILLINOIS
### ATTD of Total Dietary Fiber

<table>
<thead>
<tr>
<th>Grain</th>
<th>ATTD of TDF, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid 1</td>
<td>66.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hybrid 2</td>
<td>70.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Barley</td>
<td>55.4&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Wheat</td>
<td>57.4&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Corn</td>
<td>56.5&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sorghum</td>
<td>55.2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Metabolizable energy, kcal/kg DMB

$P < 0.05$

Hybrid 1: 3,499
Hybrid 2: 3,459
Barley: 3,342
Wheat: 3,641
Corn: 3,732
Sorghum: 3,573
Hybrid rye for sows
Hybrid rye for sows

- Satiety
- Growth
- Nutrition
- Health
- Immune function
- Stress
- Laxation
- Milk production

Images of pigs and piglets.
Sow dietary treatments

FORMULATED FOR GESTATION + LACTATION

Control: Corn/SBM

SBM

Other

SB hulls, SB oil, vitamins, minerals

Corn

Illinois
Sow dietary treatments

Replaces 25% of corn with hybrid rye

FORMULATED FOR GESTATION + LACTATION

SB hulls, SB oil, vitamins, minerals

Corn

Other

SBM

Hybrid Rye
Sow dietary treatments

FORMULATED FOR GESTATION + LACTATION

Replaces 50% of corn with hybrid rye

SB hulls, SB oil, vitamins, minerals

Other

Corn

SBM

Hybrid Rye
Sow dietary treatments

FORMULATED FOR GESTATION + LACTATION

Replaces 75% of corn with hybrid rye

SB hulls, SB oil, vitamins, minerals

Other

Hybrid Rye

SBM

Corn
Methods

- **Body weights:** Sows and/or piglets
- **Serum:** IgG, IgA, IL-1β, IL-6, TNF-α
- **Milk:** IgG, IgA, SCC, MUN, fat, protein, lactose

Timeline:
- **0** days of gestation: BREED
- **7** days of gestation: ALLOT
- **90** days of gestation: BUMP FEED
- **105** days of gestation: MOVE TO LACTATION
- **~115** days of gestation: FARROW
- **13** days of lactation: SAMPLE
- **21** days of lactation: WEAN

Formula: \( x \times 200 \)
No Differences in BW

Initial BW, kg

Control  17.5% Rye  35% Rye  52.5% Rye

Quadratic $P = 0.345$

Day 105 BW, kg

Control  17.5% Rye  35% Rye  52.5% Rye

Linear $P = 0.302$

Quadratic $P = 0.203$
No Differences in ADG and ADFI

**ADG, kg**

<table>
<thead>
<tr>
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<th>17.5% Rye</th>
<th>35% Rye</th>
<th>52.5% Rye</th>
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</thead>
<tbody>
<tr>
<td>Linear</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadratic</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Linear $P = 0.926$

Quadratic $P = 0.425$

**ADFI, kg**

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<td>Quadratic</td>
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<td></td>
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Linear $P = 0.382$

Quadratic $P = 0.284$
BW after Farrowing and at Weaning not Different

**Farrow BW, kg**

- Control
- 17.5% Rye
- 35% Rye
- 52.5% Rye

**Wean BW, kg**

- Control
- 17.5% Rye
- 35% Rye
- 52.5% Rye

Linear $P = 0.693$

Quadratic $P = 0.299$

Linear $P = 0.401$

Quadratic $P = 0.603$

**BW after Farrowing and at Weaning not Different**
ADG and ADFI in lactation not different

**ADG, kg**

- Linear $P = 0.406$
- Quadratic $P = 0.374$

**ADFI, kg**

- Linear $P = 0.721$
- Quadratic $P = 0.199$

ADG and ADFI in lactation not different
Weaned, pigs

- Linear: $P = 0.858$
- Quadratic: $P = 0.007$

Mortality, %

- Linear: $P = 0.288$
- Quadratic: $P = 0.262$
**Litter wt., kg**

- Linear: $P = 0.133$
- Quadratic: $P = 0.191$

**Live litter wt., kg**

- Linear: $P = 0.451$
- Quadratic: $P = 0.258$
**Litter wean wt., kg**

- Linear $P = 0.465$
- Quadratic $P = 0.011$

**Litter ADG, kg**

- Linear $P = 0.276$
- Quadratic $P = 0.013$
### Avg. live wt., kg

- **Linear** $P = 0.980$
- **Quadratic** $P = 0.357$

### Avg. wean wt., kg

- **Linear** $P = 0.316$
- **Quadratic** $P = 0.458$
Avg. pig ADG, kg

Linear $P = 0.123$
Quadratic $P = 0.371$

Est. milk/d, kg

Linear $P = 0.275$
Quadratic $P = 0.013$
Conclusions, Hybrid Rye

1. Distinct different composition
2. Digestibility similar to corn
3. May also improve intestinal health
Hybrid Rye For Sows

1. No negative impact of 52.5% hybrid rye in sow diets
2. Possible that greater inclusion is OK
3. Increase in weaned pigs per litter with hybrid rye
4. Milk yield appears to be greater with moderate levels of hybrid rye
Impact of hybrid rye on diet palatability

Future Work

Growth performance of weaned pigs and growing finishing pigs

Impact of hybrid rye on carcass quality

Improved Pig Performance