Home grown rapeseed meal as soya bean meal alternative for grower and finisher pigs

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Background

- Rapeseed meal (RSM) is a protein source for fattening pig diets, with typical upper inclusion limit in the UK of ~15%.
- Recent Canadian studies indicate that greater levels of RSM may be used in weaned pigs without detrimental impact on performance.
- Could RSM prepared from modern varieties of UK oilseed rape be used at greater than 15% inclusion levels and as such replace soya bean meal (SBM) in fattening pig diets?
Objective

• To establish to what extent RSM of two oilseed rape varieties (DK Cabernet and PR46W21) can replace SBM in growing and finishing pig diets
Pigs, housing and diets

• Ninety-six finisher pigs
  – Initial BW: 33.8±0.4 kg (growers)
  – 56.2±0.8 kg (finishers)

• Two rounds of 16 pens in each phase
  – Single sex; 3 pigs per pen

• Diets
  – Control: SBM based diets
  – RSM max: 25% RSM at expense of SBM for each variety
  – Control and RSM-max were mixed for dose-response
  – Formulated to meet BSAS (2003) requirement for “lean and fast growing pigs”
## Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>NE (MJ/kg)</th>
<th>DE (MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SID Lys (g/kg)</td>
<td>9.8</td>
<td>8.9</td>
</tr>
<tr>
<td>Total Lys (g/kg)</td>
<td>11.7</td>
<td>10.6</td>
</tr>
<tr>
<td>SID Met (g/kg)</td>
<td>2.9</td>
<td>2.7</td>
</tr>
<tr>
<td>SID Thr (g/kg)</td>
<td>6.4</td>
<td>5.8</td>
</tr>
<tr>
<td>SID Try (g/kg)</td>
<td>1.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Ca (g/kg)</td>
<td>7.2</td>
<td>6.8</td>
</tr>
<tr>
<td>digP (g/kg)</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>NDF (max, g/kg)</td>
<td>130</td>
<td>180</td>
</tr>
</tbody>
</table>
## Test diets (growers)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>SBM control</th>
<th>Max DK</th>
<th>Max PR46</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBM</td>
<td>220</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>DK Cabernet</td>
<td>0</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td>PR46W21</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>Wheat</td>
<td>340.12</td>
<td>237.70</td>
<td>237.89</td>
</tr>
<tr>
<td>Barley</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Wheat feed</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Soya oil</td>
<td>11</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Lysine</td>
<td>2.46</td>
<td>4.6</td>
<td>4.53</td>
</tr>
<tr>
<td>Methionine</td>
<td>0.55</td>
<td>0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>Threonine</td>
<td>0.69</td>
<td>0.93</td>
<td>0.91</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>0</td>
<td>0.31</td>
<td>0.21</td>
</tr>
<tr>
<td>DCP</td>
<td>7.7</td>
<td>6.65</td>
<td>6.65</td>
</tr>
<tr>
<td>Limestone</td>
<td>10.98</td>
<td>8.05</td>
<td>8.05</td>
</tr>
<tr>
<td>Salt</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Premix</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>
## Test diets (finishers)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>SBM control</th>
<th>Max DK</th>
<th>Max PR46</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBM</td>
<td>180</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DK Cabernet</td>
<td>0</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td>PR46W21</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>Wheat</td>
<td>265.02</td>
<td>164.97</td>
<td>165.16</td>
</tr>
<tr>
<td>Barley</td>
<td>315</td>
<td>315</td>
<td>315</td>
</tr>
<tr>
<td>Wheat feed</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Soya oil</td>
<td>13.7</td>
<td>45.4</td>
<td>45.4</td>
</tr>
<tr>
<td>Lysine</td>
<td>2.24</td>
<td>4.37</td>
<td>4.3</td>
</tr>
<tr>
<td>Methionine</td>
<td>0.42</td>
<td>0.13</td>
<td>0.13</td>
</tr>
<tr>
<td>Threonine</td>
<td>0.53</td>
<td>0.76</td>
<td>0.74</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>0</td>
<td>0.27</td>
<td>0.17</td>
</tr>
<tr>
<td>DCP</td>
<td>6.35</td>
<td>5.25</td>
<td>5.25</td>
</tr>
<tr>
<td>Limestone</td>
<td>10.94</td>
<td>8.05</td>
<td>8.05</td>
</tr>
<tr>
<td>Salt</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Premix</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Experimental design

- Appropriate volumes of SBM control and RSM max meals were mixed
- Seven pelleted test diets
  - SBM control
  - 5, 15 and 25% RSM for each variety
- Replicates
  - n=4 pens per RSM diet
  - n=8 pens for SBM control
  - Pen allocation balanced for sex
- Gradual and complete replace of SBM
- Gradual reduction in wheat by 30-40%
Observations

- Experimental schedule
  - Day-7 (entry in pens and standard feed)
  - Day-2 (1/3 test diet)
  - Day-1 (2/3 test diet)
  - Day0-21: full on test diets

- Daily weighing of feed offered

- Regular weighing of feed refusals
  - days 0, 7, 14 and 21

- Regular weighing of pigs
  - days -7, 0, 7, 14 and 21

- Feed samples during feeding
Calculations and statistics

• Performance parameters
  – Average daily feed intake (ADFI)
  – Average daily gain (ADG)
  – Feed conversion ratio (ADFI/ADG)

• Statistical analysis
  – 7 × 2 factorial (diet × sex) with covariates
    • No interactions with sex, so focus on diet effect here
  – Contrast statements to assess:
    • Effect of RSM per se
    • DK Cabernet vs PR46W21
    • Effect of RSM level
    • Interaction between type and level
Feed intake (growers)

Statistics
- RSM per se: $P=0.027$
- Type: $P=0.006$
- Level: $P=0.001$
- Interaction: $P=0.047$

- **Statistics**

- **RSM inclusion level (%)**

- **ADF (g/d)**

- **DK Cabernet**
- **PR46W21**
Weight gain (growers)

Statistics
- RSM per se: $P = 0.061$
- Type: $P = 0.279$
- Level: $P = 0.048$
- Interaction: $P = 0.929$
Feed conversion ratio (growers)

**Statistics**
- RSM per se: $P=0.232$
- Type: $P=0.516$
- Level: $P=0.463$
- Interaction: $P=0.457$
Feed intake (finishers)

Statistics

- RSM per se: P=0.562
- Type: P=0.269
- Level: P=0.299
- Interaction: P=0.317
Weight gain (finishers)

Statistics

- RSM per se: $P=0.546$
- Type: $P=0.228$
- Level: $P=0.321$
- Interaction: $P=0.963$

![Graph showing weight gain (BWG) in g/d with varying RSM inclusion levels.](image)
Feed conversion ratio (finishers)

Statistics
- RSM per se: $P=0.881$
- Type: $P=0.800$
- Level: $P=0.040$
- Interaction: $P=0.070$

![Graph of Feed Conversion Ratio (FCR) with RSM inclusion level (%) on the x-axis and FCR (g/g) on the y-axis. The graph compares two types, DK Cabernet and PR46W21, with error bars indicating variability.](image-url)
Conclusion

- Gradual exchange of SBM/wheat for RSM resulted in reduced performance of grower pigs at 15% inclusion but similar performance in finisher pigs.
- Impact on growers seems stronger for PR46 than for DK CAB but no variety effect for finishers.
- Greater than classically thought levels of RSM (~15%) may be used in nutritionally complete finisher diets BSC to completely replace SBM and reduce reliance on wheat.
- This benefit is not demonstrated for the more sensitive growers.
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  – Justine Labbe

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