Lysine restriction during finishing phase affects growth performance, carcass characteristics and meat quality of heavy pigs

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A 20% of pigs is intended for dry-cured products and its economical value reach around 15%

Dry-cured ham is the most important one (5 PDO)
### Requirements for Dry-cured ham production

**Genetic breed**
- Iberian, Duroc and fatty lines

**Slaughter weight** > 100 kg of body weight

**Nutrition (ingredients and nutrients)**
- ↑ Fattiness in carcass and in meat
A high lean deposition → Higher needs of protein

Lower fatness at finisher phase
The effect of lysine restriction in finisher phase, after slight restriction during grower phase, on performance, carcass characteristics and meat quality of heavy pigs
Animals: 160 Duroc x (Landrace x Large White) pigs

- ½ Barrows y ½ Gilts
- Beginning: 28.3 ± 4.52 kg BW (blocks by sex and BW)
- Final: 129.2 ± 2.61 kg BW

Diets:
- A common diet during grower period (30 to 90 kg BW)
  - 3.26 Mcal ME/kg and 0.78 % SID Lys
- Four diets during finisher period (90 to 130 kg BW):
  - 3.10 Mcal ME/kg, SID Lys: 0.63, 0.56, 0.42 and 0.32 %

Five replicates (5 Barrows and 5 Gilts) of 4 animals/treatment
## Experimental Feeds: ingredients

<table>
<thead>
<tr>
<th></th>
<th>%</th>
<th>Grower diet</th>
<th>Finisher diets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.63</td>
</tr>
<tr>
<td>Barley</td>
<td>16.7</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Wheat</td>
<td>22</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Corn</td>
<td>24</td>
<td>21.0</td>
<td>26.8</td>
</tr>
<tr>
<td>Soybean meal 44%CP</td>
<td>22.6</td>
<td>17.4</td>
<td>11.6</td>
</tr>
<tr>
<td>Rapeseed meal</td>
<td>3.0</td>
<td>9.3</td>
<td>9.3</td>
</tr>
<tr>
<td>Blended fat</td>
<td>3.0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Macrominerals</td>
<td>2.37</td>
<td>1.46</td>
<td>1.46</td>
</tr>
<tr>
<td>Vitamin-mineral premix¹</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

¹Provided the following (per kilogram of complete diet): 7,000 IU Vitamin A; 1,300 IU Vitamin D³; 10 IU Vitamin E; 0.4 mg Vitamin K³; 0.8 mg Vitamin B₁; 3 mg Vitamin B²; 1 mg Vitamin B₆; 15 µg Vitamin B₁₂; 12 mg nicotinic acid; 8 mg calcium pantothenate; 10 mg choline chloride; 1 µg Biotine; 15 mg Cu (copper sulfate); 80 mg Fe (ferrous carbonate); 35 mg Mn (manganese sulphate); 80 mg Zn (zinc oxide); 0.1 mg Co (cobalt carbonate); 0.3 mg Se (sodium selenite); and 0.3 mg I (potassium iodate).
<table>
<thead>
<tr>
<th></th>
<th>Grower diet</th>
<th>Finisher diets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.63</td>
</tr>
<tr>
<td>ME, Kcal/kg</td>
<td>3260</td>
<td>3100</td>
</tr>
<tr>
<td>Crude Protein, %</td>
<td>19.3</td>
<td>19.2</td>
</tr>
<tr>
<td>NDF, %</td>
<td>11.1</td>
<td>14.0</td>
</tr>
<tr>
<td>Ether Extract, %</td>
<td>4.15</td>
<td>4.29</td>
</tr>
<tr>
<td>Starch, %</td>
<td>36.8</td>
<td>39.2</td>
</tr>
<tr>
<td>SID lysine, %</td>
<td>0.78</td>
<td>0.63</td>
</tr>
</tbody>
</table>
### INTRODUCTION

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<table>
<thead>
<tr>
<th>Productive measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productive traits</strong></td>
</tr>
<tr>
<td>- Average daily gain (ADG, g/kg)</td>
</tr>
<tr>
<td>- Average daily feed intake (ADFI, g/kg)</td>
</tr>
<tr>
<td>- Feed conversion ratio (FCR, g/g)</td>
</tr>
</tbody>
</table>
Carcass Characteristics

- Carcass weight and yield
- Carcass size
  - Carcass length
  - Ham length
  - Ham circumference
- Yield of main trimmed lean cuts
  (ham, shoulder and loin)
- Fat thickness at last 3rd-4th ribs and GM
Meat Quality

- Color: Cie L*a*b*
- Chemical composition
  - Moisture
  - Protein
  - Intramuscular fat
- Warner Bratzler shear force

- Factorial model 2 (sexes) x 4 (diets in base on Lys content)
- Procedure GLM
Productive parameters of finisher phase

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<table>
<thead>
<tr>
<th>Level of total Lys (%)</th>
<th>ADG (g/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.65</td>
<td>700</td>
</tr>
<tr>
<td>0.60</td>
<td>750</td>
</tr>
<tr>
<td>0.55</td>
<td>800</td>
</tr>
<tr>
<td>0.50</td>
<td>850</td>
</tr>
<tr>
<td>0.45</td>
<td>900</td>
</tr>
<tr>
<td>0.40</td>
<td>950</td>
</tr>
<tr>
<td>0.35</td>
<td>1,000</td>
</tr>
<tr>
<td>0.30</td>
<td>1,050</td>
</tr>
</tbody>
</table>

**ADG (g/d)**

**ADFI (kg/d) and FCR (g/g)**

*ADG (g/d)*

L***

Level of total Lys (%)
Productive parameters of finisher phase

- **ADG (g/d)**
- **ADFI (kg/d)**
- **FCR (g/g)**

**Level of total Lys (%):**
- L***
- L***

**Graph:**
- ADG (red line)
- ADFI (blue line)

**Axes:**
- **ADG (g/d)**
- **ADFI (kg/d)**
- **Level of total Lys (%)**
### Results

**Productive parameters**

1. **ADG (g/d)**
   - Barrows: 800 g/d
   - Gilts: 750 g/d

2. **ADFI (kg/d)**
   - Barrows: 4.0 kg/d
   - Gilts: 3.5 kg/d

3. **FCR (g/g)**
   - Barrows: 3.3 g/g
   - Gilts: 3.5 g/g

### Statistics

- **ADG**: **P = 0.055**
- **ADFI**: **P = 0.014**

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**Backfat thickness (mm)**

![Graph showing backfat thickness at different levels of SID Lys (％). The graph plots Fat depth (mm) against Level of SID Lys (％). Two lines are depicted: one for 3rd-4th last ribs and another for At Gluteus medius muscle.](image-url)
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Backfat thickness (mm)

![Bar Chart]

- **3rd-4th last ribs**
  - Barrows: 25
  - Gilts: 23
  - Significance: **

- **At Gluteus medius muscle**
  - Barrows: 22
  - Gilts: 19
  - Significance: **
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Main trimmed lean cuts (kg)

Level of SID Lys (%)

L*

TOTAL

(ham + shoulder + loin)

0.70 0.60 0.50 0.40 0.30

Gilts Barrows

*
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Meat Quality

\[ P = 0.045 \]

\[ P = 0.047 \]

- Barrows
- Gilts
**Chemical Composition of Meat**

### Protein (%)

- **m. Longissimus thoracis**
  - L**
  - L***

- **m. Gluteus medius**
  - L***

### Intramuscular fat (%)

- **m. Longissimus thoracis**
  - L**
  - L***

- **m. Gluteus medius**
  - L***

**Level of total Lys (%)**

- 0.65
- 0.60
- 0.55
- 0.50
- 0.45
- 0.40
- 0.35
- 0.30

**Level of total Lys (%)**

- 0.65
- 0.60
- 0.55
- 0.50
- 0.45
- 0.40
- 0.35
- 0.30

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Chemical Composition of Meat

**Protein (%)**

- m. Gluteus medius
- m. Longissimus thoracis

**Intramuscular fat (%)**

- Barrows
- Gilts

- m. Gluteus medius
- m. Longissimus thoracis
A decrease of dietary Lys content from 0.63 to 0.32% during the finisher period exposed:

- the low capacity of mature pigs (90 kg BW) for response to a Lys restriction
- linear and negative relations between productive parameters and meat quality.

Thank you for your attention
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