Evaluation of the effect of benzoic acid with or without a direct fed microbial on the performance and health of growing and finishing pigs

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Introduction

• Organic acids and direct-fed microbials present potential physiological benefits to the pig through improved gut health
• Important to understand economic potentials in the form of improved pig performance

Objective

• To determine the effects of benzoic acid, in combination of a direct-fed microbial, on growth performance of growing and finishing swine

Animals:

• 320 crossbred barrows and gilts (DNA 600 X 241; DNA Genetics, Columbus, NE) 35.51 ± 3.75 kg
• PRRS, PEDv, and APP negative
• Sorted into split-sex pens
• Fed a common diet for 11 days pre-trial

Data collection:

• Weights of pigs and feeders captured on days 0, 7, 18, 28, 39, 49, 60, 70, and 81
• Ultrasound conducted on day 81 for backfat and loin eye area at the 10th rib

Treatment allocation:

• Randomized complete blocks equalized by weight
• 8 pigs per pen
• Assigned to 1 of 4 dietary treatments:
  1. Standard commercial (PC)
  2. 85% PC SID Lysine and lowered crude protein (NC)
  3. PC plus 0.3% benzoic acid (BA; VevoVitall, DSM Nutritional Products, Parsippany, NJ)
  4. PC plus 0.3% BA and 0.025% direct fed microbial (BA+DFM; PureGro, DSM Nutritional Products, Parsippany, NJ)

Materials and methods

Statistical analysis

Table 1. Overall (days 0 to 81) effect of dietary treatment on body weight (BW), average daily gain (ADG), average daily feed intake (ADFI), gain-to-feed ratio (G:F), backfat (BF), loin eye area (LEA), removals, and therapeutic interventions

<table>
<thead>
<tr>
<th>Item</th>
<th>PC</th>
<th>BA</th>
<th>BA+DFM</th>
<th>NC</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial BW, kg</td>
<td>35.69</td>
<td>35.66</td>
<td>35.34</td>
<td>35.35</td>
<td>0.210</td>
<td>0.48</td>
</tr>
<tr>
<td>Final BW, kg</td>
<td>123.17</td>
<td>125.64</td>
<td>123.67</td>
<td>122.53</td>
<td>0.871</td>
<td>0.09</td>
</tr>
<tr>
<td>ADG, kg</td>
<td>1.07b</td>
<td>1.11a</td>
<td>1.09ab</td>
<td>1.07b</td>
<td>0.010</td>
<td>0.03</td>
</tr>
<tr>
<td>ADFI, kg</td>
<td>2.78b</td>
<td>2.91a</td>
<td>2.85ab</td>
<td>2.83ab</td>
<td>0.030</td>
<td>0.03</td>
</tr>
<tr>
<td>G:F</td>
<td>0.176a</td>
<td>0.175ab</td>
<td>0.174ab</td>
<td>0.172b</td>
<td>0.001</td>
<td>0.07</td>
</tr>
<tr>
<td>BF, cm</td>
<td>2.07a</td>
<td>2.12ab</td>
<td>2.23b</td>
<td>2.28c</td>
<td>0.051</td>
<td>0.03</td>
</tr>
<tr>
<td>LEA, cm²</td>
<td>43.67</td>
<td>43.33</td>
<td>42.36</td>
<td>42.06</td>
<td>0.601</td>
<td>0.20</td>
</tr>
<tr>
<td>Removals, %</td>
<td>3.75</td>
<td>2.53</td>
<td>0.00</td>
<td>1.25</td>
<td>-</td>
<td>0.23</td>
</tr>
<tr>
<td>Therapeutic interventions, %</td>
<td>16.25</td>
<td>8.86</td>
<td>3.75</td>
<td>8.75</td>
<td>-</td>
<td>0.07</td>
</tr>
</tbody>
</table>

1 Least squares means not connected by the same letter are significantly different (P ≤ 0.05)

Results

• Performance data were analyzed in SAS using the following statistical model:
  \[ Y_{ijkl} = \mu + T_i + S_j + B_k + e_{ijkl} \]
  Where \( Y_{ijkl} \) is the observed value of the \( l \)th pen of \( k \)th level of sex in \( j \)th block receiving \( i \)th diet; \( \mu \) is the intercept, \( T_i \) is the fixed effect of diet; \( S_j \) is the fixed effect of sex; \( B_k \) is the fixed effect of block; \( e_{ijkl} \) is the random error

• Least squares means were separated using Fisher’s Least Significant Difference test
• Differences in total removals and therapeutic interventions were tested using Fisher’s Exact Test
• Results were considered significant at \( P \leq 0.05 \) and a trend at \( P > 0.05 \) and \( P \leq 0.10 \)

Summary

• Reducing lysine and crude protein levels resulted in poorer gain efficiency and increased backfat
• Benzoic acid resulted in increased gain in growing and finishing pigs from approximately 35 to 125 kg

Acknowledgements

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