Supplemental Effects of Ruminal Bypass Arginine and Lysine for Improving Meat Quality and Oxidative Stability of Aged Beef Loin

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Introduction

- Postmortem aging has been demonstrated to improve eating quality characteristics such as tenderness, juiciness, and flavor due to proteolytic, lipolytic and oxidative reactions. Extended aging periods have been demonstrated to lower color stability of beef muscles due to lipid and myoglobin oxidation. Surface meat color has been rated by consumers to be the most important appearance quality trait at purchase.

Objective

The objective of this study was to evaluate changes in meat quality and oxidative stability of beef loin samples due to ruminal bypass arginine and/or lysine supplementation after undergoing aging periods of 14 and 28 days.

Materials and Methods

- Ten paired beef loin sections (M. longissimus lumborum, LL) per each dietary treatment (control, Arg, Lys, ArgLys) were collected at 1-day postmortem from beef carcasses (a total of 40 beef cattle).
- Loin sections were deboned, vacuum sealed, and assigned to aging periods of either 14 or 28 days. Samples were aged in a 2-3°C walk-in cooler.
- After each assigned aging period, three steaks were collected.
- Steak 1 was displayed under simulated retail conditions (on foam tray under fluorescent lighting) and visual color measurements were taken using a Hunter Miniscan EZ colorimeter daily for a 7-day period.
- Steak 2 was used for Warner-Batzler shear force and cooking loss measurements.
- Steak 3 was powdered and will be used for further biochemical analysis.

Results and Discussion

- 28d aging significantly lowered visual lean color and increased discoloration over the display period (P < 0.05) (Fig. 3a-b).
- Arg and ArgLys treatments showed significantly higher visual lean color and lower discoloration over the display period (P < 0.05) (Fig. 3a-b).
- Instrumental color measurements supported the visual measurements, showing similar trends of extended aging decreasing redness and color intensity and increasing discoloration over the display period, while Arg and ArgLys supplementation showed a trend of better oxidative stability (4a,b,c).

Table 1: Effect of arginine/lysine supplementation and aging period on pH, water-holding capacity and shear force of beef loin

<table>
<thead>
<tr>
<th>Supplement Effect</th>
<th>pH</th>
<th>Water-holding capacity (%)</th>
<th>Shear force (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control diet</td>
<td>5.61</td>
<td>2.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Arginine</td>
<td>5.55</td>
<td>3.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Lysine</td>
<td>5.63</td>
<td>3.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Arginine+Lysine</td>
<td>5.62</td>
<td>2.6</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Aging period effect

- 14 days: 5.54y 2.6y 1.6 28.5x 1.9x 4.1x
- 28 days: 5.6x 3.2x 2.7 26.8x 1.5y 3.3y

Conclusions

- Extended aging period significantly lowered oxidative stability of beef loin muscle, but increased tenderness as shown by decreased shear force values (P < 0.05).
- Arginine supplementation significantly increased oxidative stability over the display period for both aging durations (P < 0.05).
- This supports that ruminal bypass arginine supplementation could be used to extend display shelf-life of beef products.
- Further research will explore biochemical measurements as relates to oxidative stability, proteolysis and lipolysis.

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References