Fibrolytic enzyme enhances feed efficiency of Nellore bulls when added to ensiling on corn-based silages


Bonn – Germany
2018
Introduction

• Exogenous fibrolytic enzymes (EFE)
  • improved *in vitro* dry matter digestion (Phakachoed et al. 2013)

• Inconsistency of responses when used as feed additive
  • suboptimal condition of the rumen (Adesogan et al. 2014);
  • Temperature = 39ºC
  • pH = 6
Hypothesis

• High moisture corn and snaplage could represent an environment, which enzymes could act properly (optimal temperature and pH) and improve silage quality and digestibility
Hypothesis

Cage Effect


Protein Matrix  Starch Granules
Hypothesis

- α-Arabinofuranosidase
- Endo-1,4-β-xylanase

Xylose

Lafond et al. 2014
Objective

• Evaluate the performance of Nellore bulls fed high moisture corn silage and snaplage with fibrolytic enzyme complex added for ensiling
Material and Methods

• **Rovabio Advance P®**

• **Talaromyces versatilis**
  • Endo-1,4-β-xylanase
    • 25,000 VU/g
  • Endo-1,3(4)-β-glucanase
    • 17,200 VU/g

• Dose - 100 g/ton of Fresh Matter
Material and Methods
Material and Methods

Snaplage Control

Snaplage added EFE

Source: Jorge Rodrigues
Material and Methods

HMC Control

HMC added EFE
Material and Methods

- Randomized Complete Block
  - Factorial 2×2

- 467 intact Nellore Bulls
  - Initial weight ~ 420 kg
  - 16 pens – experimental units
Material and Methods

Weighing

ADAPTATION

Dry matter intake - daily
Feed sampling - weekly

Feces sampling

DAYS

0 27 57 76 101 122
### Material and Methods

**Composition of experimental diets (DM)**

<table>
<thead>
<tr>
<th>Item</th>
<th>SNAP + HMC&lt;sup&gt;¹&lt;/sup&gt;</th>
<th></th>
<th>WPCS&lt;sup&gt;²&lt;/sup&gt; + HMC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Enzyme</td>
<td>Control</td>
<td>Enzyme</td>
</tr>
<tr>
<td>Whole Plant Corn Silage</td>
<td>-</td>
<td>-</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Snaplage</td>
<td>27.65%</td>
<td>27.65%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High Moisture Corn</td>
<td>51.13%</td>
<td>51.13%</td>
<td>53.18%</td>
<td>53.18%</td>
</tr>
<tr>
<td>Soybean Hulls</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Soybean Meal</td>
<td>5.42%</td>
<td>5.42%</td>
<td>6.02%</td>
<td>6.02%</td>
</tr>
<tr>
<td>Total Puraphós AEB (25% Urea)*</td>
<td>3.80%</td>
<td>3.80%</td>
<td>3.80%</td>
<td>3.80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter</td>
<td>66.61%</td>
<td>66.31%</td>
<td>62.61%</td>
<td>62.10%</td>
</tr>
<tr>
<td>Ash</td>
<td>5.00%</td>
<td>5.04%</td>
<td>5.28%</td>
<td>5.33%</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>13.56%</td>
<td>12.61%</td>
<td>12.99%</td>
<td>12.75%</td>
</tr>
<tr>
<td>Ether Extract</td>
<td>3.60%</td>
<td>3.66%</td>
<td>3.39%</td>
<td>3.47%</td>
</tr>
<tr>
<td>NDF</td>
<td>26.52%</td>
<td>27.84%</td>
<td>29.41%</td>
<td>29.39%</td>
</tr>
<tr>
<td>Starch</td>
<td>47.43%</td>
<td>47.10%</td>
<td>42.73%</td>
<td>43.93%</td>
</tr>
<tr>
<td>NFC</td>
<td>51.31%</td>
<td>50.85%</td>
<td>48.93%</td>
<td>49.07%</td>
</tr>
</tbody>
</table>

<sup>¹</sup> Dose/animal – 1.05 g

<sup>²</sup>Dose/animal – 0.72 g; WPCS – not added EFE

*Monensin – 800 mg/kg
## Material and Methods

<table>
<thead>
<tr>
<th>Daily Feed bunk score</th>
<th>Score description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>+ 1 kg of DM of diet/bull</td>
</tr>
<tr>
<td>-1</td>
<td>+ 0.5 kg of DM of diet/bull</td>
</tr>
<tr>
<td>0</td>
<td>+ 0.3 kg of DM of diet/bull</td>
</tr>
<tr>
<td>0.5</td>
<td>Quantity (DM) equal to the last day, after two following increases on diet offered</td>
</tr>
<tr>
<td>1</td>
<td>Quantity (DM) equal to the last day (target)</td>
</tr>
<tr>
<td>1.5</td>
<td>- 0.3 kg of DM of diet/bull</td>
</tr>
<tr>
<td>2</td>
<td>- 1 kg of DM of diet/bull</td>
</tr>
<tr>
<td>3</td>
<td>Manual adjustment to reach the score 1</td>
</tr>
<tr>
<td>Full</td>
<td>Night score for full feed bunk</td>
</tr>
<tr>
<td>Empty</td>
<td>Night score for empty feed bunk</td>
</tr>
</tbody>
</table>
Results
Results

DMI (kg/d)

-2.1%

SEM – 0.34; Diet – P=0.001; Enzyme – P=0.0235; D*E – P=0.0913
Results

ADG (kg/d)

- **Snap + HMC**
  - Control: 1.41
  - Enzyme: 1.49

- **WPCS + HMC**
  - Control: 1.55
  - Enzyme: 1.53

SEM – 0.05 ; Diet – P=0.0208 ; Enzyme – P=0.4742 ; D*E – P=0.1468
Results

Feed Efficiency

Control: 0.1636
Enzyme: 0.1704

+ 4.2%

SEM – 0.005; Diet – P=0.3358; Enzyme – P=0.0792; D*E – P= 0.3978
Results

SEM – 1.05; Diet – P=0.7286; Enzyme – P=0.0791; D*E – P=0.4484

TDN (%)

Control: 81.29
Enzyme: 82.88

+ 2.0%
Results

Control: 1.98
Enzyme: 2.03

+ 2.5%

SEM – 0.03 ; Diet – P=0.7291 ; Enzyme – P=0.0792 ; D*E – P=0.4484
Results

NEg (Mcal/kg)

Control: 1.32
Enzyme: 1.37

SEM – 0.03; Diet – P=0.7285; Enzyme – P=0.0791; D*E – P=0.4485

+ 3.4%
Results

NDF (%DM)

Control: 44.96\textsuperscript{a}

Enzyme: 37.88\textsuperscript{b}

Snaplage:

- Control: 11.41\textsuperscript{c}
- Enzyme: 11.50\textsuperscript{c}

HMC:

- Control: 
- Enzyme: 

SEM – 1.26; Silage – P<0.001; Enzyme – P=0.013; S*E – P=0.0112
Results

HMC _In Vitro_ DMD (%)

Control: 95.56

Enzyme: 96.76

SEM – 0.37 ; Enzyme – P=0.0504

+ 1.3%
Results

In vivo Starch Digestibility (%)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Enzyme</th>
<th>Control</th>
<th>Enzyme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap + HMC</td>
<td>94.09</td>
<td>95.06</td>
<td>95.24</td>
<td>97.09</td>
</tr>
<tr>
<td>WPCS + HMC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SEM – 0.49; Diet – P=0.0043; Enzyme – P=0.0089; D*E – P=0.3463

+ 1.5%
Conclusion

• The addition of fibrolytic enzyme complex on corn-based silages can improve feed efficiency in beef cattle, probably due to the increase in the digestibility, by facilitating the access to the starch granules
Acknowledgments
Vielen Dank!