Estimation of individual intake of grazing dairy cows with RumiWatch®

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Background and Objective

- Intake estimation of grazing dairy cows is time consuming and expensive
- Estimation with markers (n-alkanes, Yb, …)
- Easier, more precise with behavioral characteristics
  - Intake = bite mass x number of eat bites
- RumiWatch® Halter
  - Manager
  - Converter
- Pressure sensor & triaxial accelerometer

Individual intake estimation of grazing dairy cows with RumiWatch® based on mean bite mass
Materials and Methods

- Previous Validation
- Latin square: 3 feeding treatments x 3 periods
- 18 Holstein cows
- 3.3 ± 2.2 lactation
- 22.9 ± 4.5 kg milk / d
- 161 ± 48 days in milk

Feeding treatments

<table>
<thead>
<tr>
<th></th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pasture + 10 kg DM maize silage</td>
</tr>
<tr>
<td></td>
<td>Pasture + 10 kg DM maize silage + protein suppl.</td>
</tr>
</tbody>
</table>

1 period

- d1 Adaptation
- d14 Intake estimation with n-alkanes
- d21
Materials and Methods

54 RumiWatch® files and individual intake estimations (7d)

Calibration \( (n = 7) \):

\[
\text{bite mass} = \frac{\text{estimated herbage intake} (n - \text{alkanes})}{\text{number of eating chews}}
\]

Validation \( (n = 6) \):

\[
\text{herbage intake} = \text{bite mass} \times \text{number of eating chews}
\]
Accuracy of RumiWatch® data for grazing dairy cows

![Bar chart showing accuracy of RumiWatch® data for grazing dairy cows. The chart compares the absolute percentage error for different parameters such as eating chews, eating time, total eating chews, total eating time, rumination boli, rumination chews, chewing per bolus, and rumination time. The bars are labeled with 'a' and 'b' to indicate significant differences, and the chart uses two converters: 0.7.3.2 and 0.7.3.11.](image)
Mass and number of bites while grazing

![Diagram showing bite mass and bites per day for different grazing conditions: Pasture, Pasture + maize silage, Pasture + maize silage + protein.]}
Herbage intake

![Bar chart showing herbage intake for different grazing scenarios (pasture, pasture + maize silage, pasture + maize silage + protein) estimated by n-alkanes and RumiWatch.](img)
Mean absolute percentage error

![Bar chart showing percentage error for different diets: pasture, pasture + maize silage, pasture + maize silage + protein.](chart.png)
Summary & Conclusion

- Less eat bites per day when supplemented with corn silage
- Larger bite mass without corn silage supplementation
- Herbage intake estimation with behavioral characteristics - influenced by mastication chews
- Further research in differentiation between mastication and prehension bites during grazing
- Bite mass estimations under different grazing conditions are needed
Thank you for your attention
Annex I: Chemical composition of the feeds (mean±SD)

<table>
<thead>
<tr>
<th>Item</th>
<th>Herbage</th>
<th>Maize sil.</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM (g/kg of wet weight)</td>
<td>162 ± 29.11</td>
<td>398 ± 33.8</td>
<td>882 ± 2.4</td>
</tr>
<tr>
<td>Analyzed nutrient and mineral composition (g/kg of DM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OM</td>
<td>889 ± 8.1</td>
<td>971 ± 0.5</td>
<td>944 ± 0.2</td>
</tr>
<tr>
<td>CP</td>
<td>199 ± 21.0</td>
<td>72 ± 5.7</td>
<td>562 ± 6.6</td>
</tr>
<tr>
<td>ADF</td>
<td>219 ± 30.2</td>
<td>194 ± 29.3</td>
<td>76 ± 3.1</td>
</tr>
<tr>
<td>NDF</td>
<td>225 ± 27.8</td>
<td>351 ± 49.7</td>
<td>316 ± 34.8</td>
</tr>
<tr>
<td>CF</td>
<td>186 ± 20.5</td>
<td>163 ± 23.8</td>
<td>34.3 ± 0.1</td>
</tr>
<tr>
<td>Ca</td>
<td>8.5 ± 0.7</td>
<td>1.6 ± 0.0</td>
<td>3.0 ± 0.0</td>
</tr>
<tr>
<td>P</td>
<td>4.9 ± 0.4</td>
<td>1.7 ± 0.0</td>
<td>6.3 ± 0.0</td>
</tr>
<tr>
<td>Mg</td>
<td>2.5 ± 0.2</td>
<td>0.8 ± 0.0</td>
<td>3.0 ± 0.0</td>
</tr>
<tr>
<td>Na</td>
<td>0.4 ± 0.0</td>
<td>0.2 ± 0.0</td>
<td>0.5 ± 0.0</td>
</tr>
<tr>
<td>K</td>
<td>39.5 ± 2.1</td>
<td>9.1 ± 0.0</td>
<td>20.5 ± 0.0</td>
</tr>
<tr>
<td>Calculated energy supply per kg of DM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEL (MJ)</td>
<td>6.4 ± 0.2</td>
<td>6.9 ± 0.3</td>
<td>8.5 ± 0.0</td>
</tr>
</tbody>
</table>
Annex II: Duration of eating on pasture

![Chart showing eating time per day for different pastures and combinations of silage and protein.]

Eating time / d

- Pasture
- Pasture + maize silage
- Pasture + maize silage + protein
Annex III: Bite rate per minute on pasture

![Graph showing bite rate per minute on pasture for different feed combinations](image-url)