THE EFFECT OF TWO HOP VARIETIES (Humulus lupulus L.) ON 
IN VITRO GAS AND VOLATILE FATTY ACID PRODUCTION IN 
DAIRY COWS

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Introduction
• ban of the use of nutritive antibiotics research of other chemical substances 
• alternatives to antibiotics secondary plant metabolites (plant essential oils ...)
• hop (Humulus lupulus L.) antimicrobial properties in beer production increased resistance to microbial spoilage 
• herbal medicine antimicrobial properties + estrogenic and anticancerogeneric properties + alleviate digestive upsets. 
• hops production >> hop utilization

Objectives
• information on the use of hops as feed additives for ruminants 
• to determine the effects of the two hop varieties, differing in the ratio between alpha- and beta-acids on fermentation in the rumen 

Material and methods
• Diet: total mixed ration (TMR) with two varieties of hop cones, Aurora (A) and Dana (D) were added in amounts corresponding to their concentration in the rumen of cow consuming 50, 100 and 200 g daily
• In vitro test:
  - in vitro gas production (Menke and Steingass, 1988) 
  - 4 samples/batch (2) incubated for 0, 2, 4, 6, 8, 10, 24, 36, 48, 72 and 96 h 
  - after 24 h two syringes short-chain fatty acids (SCFA) analysis (Holdeman et al, 1977)
• Calculations and statistical analysis
  - in vitro gas production data fitted with the Gompertz model (estimated and calculated parameters were "B", "C", "D", maximum fermentation rate ("MFR"), time of maximum fermentation rate ("Tmfr"), volume of gas produced in 24 h ("Gas24") 
  - differences were tested for the effects of hop variety, hop concentration and their interaction

Conclusions
• the supplementation of diets with hops changed the fermentation pattern in vitro hop cones contain antimicrobial substances which modulate rumen fermentation 
• these data are not sufficiently conclusive to give a definitive recommendation about the variety and amount of hops fed to ruminant animals other in vitro and in vivo studies should be performed before thorough conclusions could be made

Results

Gas production curves of TMR and TMR containing different varieties and amounts of hops. 
Short-chain fatty acid concentrations (mmol/l DM) in the buffered rumen fluid after incubation of hop concentrates:

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Acetic</th>
<th>Propionic</th>
<th>Butyric</th>
<th>TSCFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMR</td>
<td>3.28a</td>
<td>1.14</td>
<td>0.78a</td>
<td>5.20a</td>
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<tr>
<td>A50</td>
<td>2.82b</td>
<td>0.90</td>
<td>0.57bc</td>
<td>4.39bc</td>
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</tr>
</tbody>
</table>

RMS = 0.440 0.356 0.078 0.758

Variety
Concentration *** *** *
Var. x conc. 0.000

References


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