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Hedges and woody strips browsing by cattle on pasture in Wallonia, Belgium

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Introduction
Shrub and tree forages are commonly used in animal production in many regions of the world. Nonetheless, in Western Europe, and especially in Wallonia in Belgium, hedges and woody strips have disappeared from the agricultural landscape over the past 60 years. Browse species are usually rich in plant secondary compounds such as tannins whose benefits on CH₄ production and intestinal parasitism have been highlighted (Ramírez-Restrepo et al. 2010). Currently, agri-environmental measures taken by the Walloon government promote hedges and woody strips in pastures, raising the interest in browse species functionalities in ruminant production.

This study aimed at: (1) determining the influence of the access to a hedge on the behaviour of cattle on pasture; and (2) evaluating the fermentability by rumen microbes of foliage of woody species promoted in the Wallon landscape.

Materials and methods
Grazing and browsing behaviour
Twelve dairy heifers, divided in 2 groups, were set to graze a ryegrass and white clover pasture during 4 consecutive weeks in May 2012. The experimental group had free access to a hedge composed of 12 tree and shrub species (Table 1) while the control group did not. Pasture biomass availability was assessed once a week and the pasture area was adjusted weekly in order to ensure sufficient forage availability. The feeding behaviour (grazing and browsing) of each heifers group was recorded during 10 hours/day replicated 2 days/week using the hand-plucking method as well as other activities (rumination, watering, social activity and walking). The activities were compared per week using the MIXED procedure of SAS 9.2 and the daily observations on each cow as experimental unit (N = 12).

Chemical composition and in vitro ruminal fermentation
The leaves of the woody species found in the hedge harvested from 3 different plants (N = 3) in late May 2012 and a sample of pasture species (white clover (Trifolium repens) and ryegrass (Lolium perenne)) were freeze-dried and analysed for crude protein and NDF contents. There were also fermented in duplicate (n = 2) with bovine ruminal fluid for 72 h and gas production recorded (Menke and Steingass 1988). Short-chain fatty acids (SCFA) were analysed after 72 h by HPLC. The chemical composition, SCFA and gas production kinetics were compared using the MIXED procedure of SAS 9.2 after mathematical modelling (Groot et al. 1996).

Results and discussion
Grazing and browsing behaviour
The feeding behaviour was influenced by the hedge. Grazing time of the control group (59.8%) was on average higher than the heifers that could browse the woody forages (54.8%; P=0.023). The other activities (rumination, watering, social activities, rest and walking) were not influenced by the access to the hedge (P>0.05).

Significant browsing was noted only during the second week of the experiment and reached 3.7% of the total time. This happened when the biomass in the pasture was low (50% less than the other weeks). During this week, grazing time of the control group tended to be higher than the experimental one (52.2% vs 41.3%; P=0.057).

Chemical composition and in vitro fermentation
The fermentation profile showed striking differences between species as did their CP and NDF contents (Table 1). Prunus spinosa, Viburnum opulus, Fraxinus excelsior and Populus nigra seem promising forages because they yielded higher gas production and/or fermentation rates than ryegrass and clover and their CP content was quite high, with the exception of Viburnum opulus. Sambucus nigra showed an outstandingly high CP content. Interestingly, while the average acetate:propionate:butyrate molar ratio across all woody species was 0.618:0.219:0.100 (data not shown), the SCFA profile of some species differed from this average (P<0.001). Quercus robur SCFA profile contained 0.853 acetate, Corylus avellana 0.542 propionate and the variability between
Table 1. Crude protein (CP) and NDF contents of leaves of woody and herbaceous species and gas production kinetics modelled according to Groot et al. (1996) incubated with rumen fluid.

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>CP (g/kgDM)</th>
<th>NDF (g/kgDM)</th>
<th>A (ml/gDM)</th>
<th>Rmax (ml/h/gDM)</th>
<th>Tmax (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lolium perenne*</td>
<td>1</td>
<td>265</td>
<td>469</td>
<td>220.2</td>
<td>18.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Trifolium repens*</td>
<td>1</td>
<td>286</td>
<td>230</td>
<td>216.4</td>
<td>22.1</td>
<td>2.5</td>
</tr>
<tr>
<td>Acer campestre</td>
<td>3</td>
<td>206 cd†</td>
<td>327 bc</td>
<td>157.4 f</td>
<td>8.8d</td>
<td>4.4 ab</td>
</tr>
<tr>
<td>Acer pseudoplatanus</td>
<td>3</td>
<td>213 cd</td>
<td>301 bc</td>
<td>203.4 c</td>
<td>19.3 b</td>
<td>2.4 de</td>
</tr>
<tr>
<td>Carpinus betulus</td>
<td>3</td>
<td>161 fg</td>
<td>270 cd</td>
<td>182.7 de</td>
<td>11.8 cd</td>
<td>3.9 bc</td>
</tr>
<tr>
<td>Cornus sanguinea</td>
<td>3</td>
<td>176 ef</td>
<td>185 e</td>
<td>165.5 ef</td>
<td>11.8 cd</td>
<td>2.4 de</td>
</tr>
<tr>
<td>Corylus avellana</td>
<td>3</td>
<td>170 fg</td>
<td>361 ab</td>
<td>172.7 ef</td>
<td>9.9 d</td>
<td>3.6 bc</td>
</tr>
<tr>
<td>Crataegus monogyna</td>
<td>3</td>
<td>162 fg</td>
<td>350 ab</td>
<td>201.9 ed</td>
<td>10.4 d</td>
<td>5.2 a</td>
</tr>
<tr>
<td>Fraxinus excelsior</td>
<td>3</td>
<td>245 b</td>
<td>341 ab</td>
<td>221.5 abc</td>
<td>20.4 b</td>
<td>2.0 ef</td>
</tr>
<tr>
<td>Populus nigra</td>
<td>3</td>
<td>217 bc</td>
<td>310 bc</td>
<td>207.7 bc</td>
<td>24.0 a</td>
<td>1.4 f</td>
</tr>
<tr>
<td>Prunus spinosa</td>
<td>3</td>
<td>202 cde</td>
<td>240 de</td>
<td>235.8 a</td>
<td>19.0 b</td>
<td>3.0 cd</td>
</tr>
<tr>
<td>Quercus robur</td>
<td>3</td>
<td>185 def</td>
<td>395 a</td>
<td>153.4 f</td>
<td>9.2 d</td>
<td>3.2 cd</td>
</tr>
<tr>
<td>Sambucus nigra</td>
<td>3</td>
<td>319 a</td>
<td>244 de</td>
<td>163.0 ef</td>
<td>14.3 c</td>
<td>2.3 de</td>
</tr>
<tr>
<td>Viburnum opulus</td>
<td>3</td>
<td>143 g</td>
<td>267 cd</td>
<td>225.3 ab</td>
<td>18.5 b</td>
<td>2.5 de</td>
</tr>
</tbody>
</table>

SEM - 0.804       1.099       4.923       0.884       0.192
Source of variation d.f. P-values
Species 11 <0.001 <0.001 <0.001 <0.001 <0.001

N: numbers of observations - d.f.: degrees of freedom - SEM: standard error of mean - DM: dry matter; A: final gas volume - Rmax: maximum rate of fermentation - Tmax: time at maximum rate of fermentation; †: For one parameter, means followed by different letters in the columns differ at significance level of 0.05; *: Not included in the statistical analysis.

individuals of Sambucus nigra was higher than for the other species, some producing high levels of valerate.

**Conclusion**

It can be concluded that in the grazing conditions in Wallonia, browsing can also be considered as a complementary forage for cattle in pastures with hedges. Some woody species seem interesting for ruminant nutrition as plain forage or to induce shifts in rumen fermentation patterns. These attributes should be better documented to allow proper advice when farmers plant hedges along pastures.

**References**

