# The effect of fermentation of *Calliandra calothyrsus*, *Gliricidia sepium*, *Leucaena leucocephala* and maize forage on rumen degradation and microbial protein synthesis

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**Introduction** Ensiling as a means of storing green fodder by acidification has a profound effect on the chemical composition of the resultant silage. Ensiling could therefore, ameliorate the effects of anti-nutritional factors associated with browses. The objective of the experiment was to determine fermentation characteristics and rumen degradation (D) of ensiled *Calliandra calothyrsus (C), Gliricidia sepium (G)*, *Leucaena leucocephala (L)* and maize forage.

**Materials and methods** Chopped materials (<5cm) of the browses (leaf and petiole) and maize forage at milk stage were ensiled in triplicate 2kg lots in polythene bags, which were tightly packed and tied and were kept in the laboratory and allowed to ferment for 30 days. Their fermentation characteristics and resulting organic matter were determined. Degradation constants of fermented and unfermented browses and maize forage were studied using two fistulated *Bos indicus* steers. The exponential equation of McDonald (1981) was used to determine the constants. Total rumen microbial protein (TRMP) yield (g/kg DM) was estimated as: TRMP = (FOM/1000) x 150, where DM is dry matter and FOM = (ED x OM/1000) x OM, where ED is effective degradability and FOM is fermentable organic matter (Muia *et. al.,* 2001).

**Results** Maize forage had higher ($P<0.05$) lactic acid and lower ($P<0.05$) pH compared to the browses. Of the browses, *Gliricidia* fermented better with higher ($P<0.05$) lactic acid. Fermentation increased degradation of OM and RMP synthesis with *Gliricidia and Leucaena* but not with *Calliandra.* The poor degradation and RMP synthesis with *Calliandra* could be attributed to its high content of lignin and tannins, which have a binding effect (Fahey *et al.,*1980).

**Table 1** Fermentation characteristics and degradation of the browse and maize forage silages OM

| | Maize | C | G | L | SE |
|---|---|---|---|---|---|
| DM (%) | $25.9^{b}$ | $35.6^{a}$ | $23.5^{c}$ | $24.4^{bc}$ | 0.73 |
| Lactic acid (% DM) | $5.0^{a}$ | $0.9^{d}$ | $2.8^{b}$ | $1.9^{c}$ | 0.21 |
| PH | $3.9^{b}$ | $5.4^{a}$ | $5.1^{a}$ | $5.3^{a}$ | 0.24 |
| $NH_3$-N (% Total N) | $10.3^{a}$ | $1.3^{c}$ | $5.6^{b}$ | $7.3^{b}$ | 0.03 |
| Potential D(u) | $566.7^{b}$ | $250.0^{d}$ | $554.1^{c}$ | $573.2^{a}$ | t=1.968 |
| Effective D(u) | $371.1^{b}$ | $206.5^{d}$ | $432.6^{a}$ | $331.8^{c}$ | t= 1.968 |
| M P g/kg OM(u ) | 52.1 | 29.3 | 59.5 | 46.8 | |
| Potential D(f) | $843.9^{a}$ | $233.8^{d}$ | $810.3^{b}$ | $687.8^{c}$ | t= 1.968 |
| Effective D(f) | $507.67^{b}$ | $207.6^{d}$ | $595.0^{a}$ | 374.0 | t= 1.968 |
| M P g/kg OM(f) | 71.3 | 29.5 | 81.8 | 52.3 | |

$^{abc}$ Values having different superscripts in a row are significantly ($P \leq 0.05$) different
Unfermented (u), Fermented (f)

**Conclusion** *Calliandra* has poor fermentation with low levels of lactic acid. Fermentation increased rumen degradation of OM and RMP synthesis with *Gliricidia, Leucaena* and maize forage but not with *Calliandra*.

**References**

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