

Complementary use of *in sacco* and *in vitro* studies to investigate ruminal forage degradation in relation to gas production

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Alfalfa hay (DM) degradation, was determined *in sacco* in three sheep for two periods and the results were adjusted according to Ørskov and Mc Donald (1979, J Agric Sci Camb, 92, 499-503). Compound samples of residues were taken at 0, 4, 12, 24 and 48 h. Five sub-samples of each one (0.3 g) were incubated *in vitro* under anaerobic conditions at 39°C, for 24 h. The batch system used, consisted in 50 ml glass bottles that contained 30 ml filtered ruminal content (0.2 cm² mesh), connected to a 20 ml glass syringe. In control systems only ruminal fluid was incubated. Ruminal content was taken out of 3 fistulated sheep before morning feeding.

Gas production was registered every hour during the first 12 h and at 24 h. The syringes were emptied at 7 and 12 h. Incubation was interrupted at 24 h and gas composition (CO₂ and CH₄) was determined on a gas chromatograph. The pH and oxidation reduction potential (ORP ; mV) in ruminal fluid were determined at the end of incubations.

In vitro gas production *in vitro* showed a negative relation with the degraded DM of incubated samples ($r = -0.92$; $P \leq 0.01$) and was higher in T0 and T4 (51 ml ± 2) than in T12, T24 and T48 (28 ml ± 1). At end of incubation, the pH showed a positive relation with a degraded DM ($r = 0.95$; $P \leq 0.01$) what confirms the higher fermentability of T0 and T4 remains. The final ORP showed a negative relation with degraded DM ($r = -0.64$; $P \leq 0.01$) ; this result shows that the most resistant material to degradation produced more reducing conditions when incubated in *in vitro* system.

The results show clearly that the higher gas production and the changes at physical and chemical level can be associated with the fraction of studied material that degrade at the first 4 h in ruminal environment and suggest the interest to investigate the role of the most resistant components (phenolic type, for example) in pH-ORP changes.

	<i>in sacco</i>	<i>in vitro</i>		final pH	ORP (mV)
	DMD ¹ (%)	Gas production (ml/24 h)	CO ₂ /CH ₄		
T0	16.8	54 ± 3	3.3 ± 0.3	6.2 ± 0.0	-328 ± 15
T4	29.5	49 ± 7	3.8 ± 0.5	6.3 ± 0.1	-319 ± 19
T12	44.0	30 ± 3	3.5 ± 0.3	6.5 ± 0.0	-327 ± 6
T24	52.6	26 ± 0	3.8 ± 0.3	6.5 ± 0.0	-354 ± 10
T48	56.2	28 ± 2	3.9 ± 0.9	6.6 ± 0.0	-362 ± 4
control	-	24 ± 3	3.4 ± 0.2	6.6 ± 0.0	-332 ± 19

¹ Dry Matter Degradation, estimated from $a + b(1 - e^{-a})$, Ørskov and Mc Donald, 1979.