The effect of sward maturity on the *in vitro* digestibility and methane production of sward components

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Introduction Methane (CH_4) from enteric fermentation accounts for 13.2% of Irelands' total greenhouse gas (GHG) emissions (McGettigan *et al*., 2008). Grassland based production dominates Irish ruminant production systems with approximately 90% of agricultural land dedicated to grazing. Grass based mitigation strategies are required to assist Ireland meet its GHG reduction targets. Sward maturity and individual sward components may impact on enteric CH_4 fermentation in grazing ruminants. The aim of this experiment was to asses the impact of maturity and individual sward components on *in vitro* digestibility and CH_4 production.

Material and methods Perennial ryegrass plots (7m x 1.5m) were closed on May 1st 2009 and harvested sequentially at 10 day intervals to give 5 harvest dates T1 (11/05/09), T2 (22/05/09), T3 (31/05/09), T4 (09/06/09) and T5 (19/06/09). The grass cuts were separated into leaf, stem and dead material, manually prior to drying. Samples were oven dried at 40°C for 48 hours, then ground to pass through a 1mm screen. Individual CH_4 emissions were measured using the *in vitro* rumen gas production technique of Mauricio *et al*. (1999). Rumen fluid was collected from three fistulated Friesian steers at 9.30am prior to feeding (60:40 grass silage to concentrate ration). Concentrate composition was: (g/kg) 830 barley. 100 soya, 50 molasses, 20 mineral and vitamins mix. Statistical analysis was performed using the mixed procedure of SAS with terms included for sward component, harvest date and their interaction. Linear and quadratic effects of harvest date were assessed separately for each sward component

Results Stem content within the harvested samples ranged from 0.20 – 0.61 on a DM basis. There was a linear decrease in apparent DM digestibility (aDMd) of leaf ($P<0.001$), stem ($P<0.001$) and dead material ($P<0.05$) as the season progressed. There was a quadratic relationship between harvest date and CH_4 per g DM incubated and digested for the leaf component ($P<0.05$) with production declining from T1 to T3 and increasing hereafter. There was a tendency for increased CH_4 per g DM digested for the stem component as the season progressed ($P=0.1$). All sward components differed for all parameters measured ($P<0.05$) with the exception of CH_4 /g DM incubated, where there was no difference between leaf and stem components ($P>0.05$). An interaction was detected for aDMd ($P<0.001$).

Table 1 Effect of sward components on *in vitro* digestibility and methane production

Treatment	Harvest						P-value	
	T1	T2	T3	T4	T5	s.e.m	Linear	Quadratic
Leaf								
aDMd	0.72[a]	0.70[b]	0.66[bc]	0.64[c]	0.59[d]	0.027	***	ns
CH_4 /g DM incubated	28.9	24.9	19.6	25.2	24.7	1.85	ns	*
CH_4 /g DM digested	40.0	36.1	29.6	39.7	42.4	2.94	ns	*
Stem								
aDMd	0.58[a]	0.47[b]	0.45[b]	0.46[b]	0.45[b]	0.022	***	***
CH_4 /g DM incubated	28.9	24.7	24.2	28.5	28.9	2.10	ns	ns
CH_4 /g DM digested	50.0	51.7	54.7	62.3	64.7	4.93	P=0.1	ns
Dead								
aDMd	0.40	0.38	0.37	0.36	0.37	0.016	*	ns
CH_4 /g DM incubated	17.3	14.7	15.4	20.2	16.5	1.65	ns	ns
CH_4 /g DM digested	43.3	38.7	42.0	56.7	45.5	5.10	ns	ns

*[a,b,c] Means within rows with different superscripts are significantly different ($P<0.05$). *$P<0.05$, **$P<0.01$, ***$P<0.001$, ns= non significant ($P>0.05$)*

Conclusions Over the range of growth stages assessed, digestibility declined and CH_4 emissions remained largely constant. Changes in content of individual components in the sward, particularly the replacement of leaf tissue with stem would likely cause an increase in CH_4 output per unit of DM digested. The effect of swards differing in maturity on *in vitro* CH_4 production merits further study.

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