Consiglio Nazionale delle Ricerche - I.S.P.A.A.M.

The use of Reading Pressure Technique to estimate cumulative and rate of gas production for a range of commercially available buffalo feeds.

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INTRODUCTION: **The objective of this study is to examine the fermentation and degradation characteristics of seven substrates (alfalfa hay, soybean flour, wheat by-product, flaked barley, ryegrass, maize silage and straw) typically used in a commercial buffalo dairy farm, using the in vitro Reading Pressure Technique [RPT] according to Mauricio *et al.* (1999). This feed evaluation system is designed to examine the rate and extent of both fermentation [gas release] and substrate degradation simultaneously. With regards to measurements, standard parameters will be evaluated i.e. dry matter (DMD) and organic matter degradation (OMD) and fermentation gas release over a 96 h incubation period.**

MATERIALS AND METHODS: **The above substrates, with the exception of the soyabean flour, were milled to pass a 2 mm diameter screen. Approximately 100 g of each of these substrates were prepared. Incubations was conducted in 125 ml serum flasks with approximately 1.0 g substrate DM per flask. Following the addition of 90 ml buffered medium, each flask will be sealed with a butyl rubber stopper, then stored overnight at room temperature. The rumen fluid inoculum was obtained pre-feeding [07.00 h] from two sets of donor animals – buffalos [Bubalus bubalis] which will have been offered a diet - ideally containing the substrates to be examined. The rumen fluid was strained through a double layer of muslin and held under CO2 in a water-bath at 39 °C until use. Prior to inoculation with 10 ml prepared rumen fluid, flask temperature was raised to 39 °C. Head-space gas pressure readings were taken using a pressure transducer throughout the incubation period at 2, 4, 6, 8, 10, 12, 15, 19, 24, 30, 36, 48, 72 and 96 h post-inoculation. The values, corrected for gas released from negative controls [rumen fluid plus buffered medium, without substrate] and for the quantity of organic matter [OM] incubated was used to generate gas volume estimates using a quadratic function derived from earlier simultaneous pressure and volume measurements.**

RESULTS: **Summaries of the data obtained on cumulative gas production are given in Table 1, while data on OMD are given in Table 2. The obtained results show that, 96 h post-inoculation, the fastest degradable feeds are soybean flour (952.28 OMD), barley flakes (894.38 OMD), ryegrass (871.04 OMD) but soybean flour produce less gas (245.54 ml v 301.07 ml (barley flakes) and 250.44 ml (ryegrass)) because of its higher content of crude protein. Also wheat by-product is highly degradable (839.44 OMD) while straw is the least degradable (667.31 OMD) because of its high content of ash and lignin that restrict degradation.**

Substrate	Cumulative gas (ml/g OM) Incubation (hours)				
	6	12	24	48	96
soybean flour	38,078	86,135	149,198	216,538	245,538
straw	37,928	78,384	132,036	197,347	236,146
maize silage	35,374	87,225	174,455	225,826	252,220
barley flakes	34,715	77,729	187,126	267,072	301,066
wheat byproduct	34,720	122,840	187,352	220,275	243,112
alfalfa hay	36,271	72,591	130,976	175,127	193,288
ryegrass	37,494	88,715	160,711	224,031	250,438

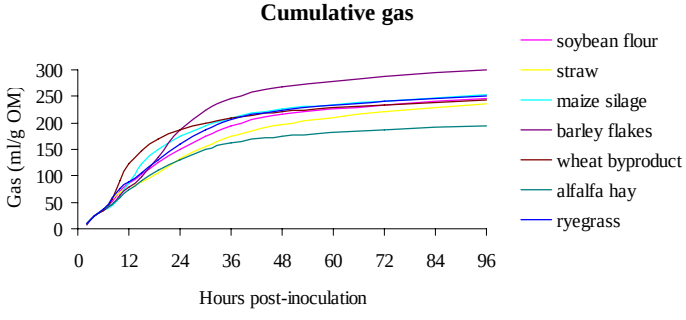

Table 1. Cumulative gas release from the seven substrates incubated *in vitro* using the Reading Pressure Technique.

Substrate	Organic matter degradation (g/g) Incubation (hours)				
	6	12	24	48	96
soybean flour	0,279	0,390	0,672	0,868	0,952
straw	0,228	0,248	0,402	0,585	0,667
maize silage	0,150	0,321	0,699	0,734	0,769
barley flakes	0,143	0,226	0,605	0,803	0,894
wheat byproduct	0,301	0,611	0,752	0,795	0,839
alfalfa hay	0,214	0,260	0,393	0,497	0,529
ryegrass	0,455	0,502	0,696	0,821	0,871

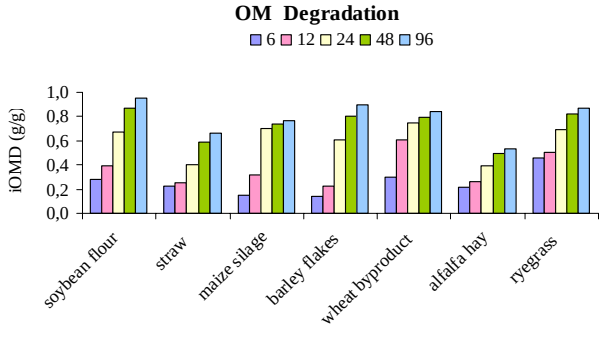

Table 2. Organic matter degradation.

CONCLUSIONS: **These data were all obtained within a week, using a less than 10 g material, and clearly demonstrate the ability of an *in vitro* system to rapidly and efficiently evaluate feedstuffs. Such systems are ideal research tools and can be used for example to screen large numbers of feed samples, to identify optimal plant husbandry techniques (e.g., fertiliser level or harvesting date) or to select candidates in breeding programs.**