The samples were ground through a 1-mm aperture prior to analysis. The ground samples were subjected to analyses for crude protein (CP), modified acid detergent fibre (MADF), tannin and continuous batch culture (in vitro) with rumen microbes and dry matter (DM) loss, gas production (GP) and total volatile fatty acids (VFA) were measured. The CP contents ranged from 106 g/kg (BS) to 166 g/kg (GM) and MADF ranged between 137 g/kg (BS) to 228 g/kg (GM) while tannin contents ranged from 53 g/kg (BS) and 72 (CM) g/kg (determined by vanillin/HCl) and 9 (GM) and 64 (AK) g/kg (determined by radial diffusion). DM loss ranged from 25% (BS) to 47% (BS) and had a strong positive correlation with VFA production ($r = 0.98$) whereas gas production was positively but much more weakly correlated with DM loss ($r = 0.92$) while tannins was poorly and negatively correlated ($r = 0.34$). Addition of a commercial preparation of polyethylene glycol (Browne Plus; Agricultura Zimbabwe pvt) to DC, CM and AK incubated in vitro with rumen microbes resulted in a small but insignificant ($P > 0.05$) improvement in DM loss which is in contrast with the large beneficial effects obtained in vivo.

13. The use of dairy cow faeces rather than rumen liquor in the gas pressure transducer technique for assessing digestion kinetics in vitro

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The pressure transducer technique requires access to rumen incubated animals but the use of faeces may be a suitable alternative. Rumen liquor (F) and faeces (F) were collected simultaneously and R mixed 1:1 with modified Van Soest medium and F 1:2. Homogenized strained 20 ml aliquots were inoculated into 250 ml bottles containing 180 ml of modified Van Soest medium and 1.5 g of a 7:3 mixture of milled air dried grass silage and 180 g crude protein per kg dry matter (DM) concentrates. After incubation at 39°C for 24 h 100 g DM of either winter beans, soya-bean meal, spring barley or rapeseed meal was added using three bottles per food for R and F. The bottles were incubated for a further 144 h and gas production measured at regular intervals. Cumulative gas production from the test food was similar for F and R of all foods ($r > 0.95$). The rate of gas production from F was greater during the first 40 h for winter beans and spring barley but total production was similar (F 304 (s.e. 4.8) ml, R 286 (s.e. 5.1) ml, (s.e.d. = 4 ± 0.9 ml, P > 0.05; and F 324 (s.e. 5.3), R 326 (s.e. 4.9), (s.e.d. = 4 ± 0.2 ml, P > 0.05 respectively). For soya-bean and rapeseed meal the rate of gas production in R and F was similar over the first 24 h but total gas production was considerably higher for F (F273 (s.e. 4.2), R 244 (s.e. 4.5) (s.e.d. = 36 ml, P > 0.01), F 174 (s.e. 5.2), R 120 (s.e. 5.5), (s.e.d. = 4 ± 0.2 ml, P > 0.001). For all foods the rate of gas production after 48 h was greater in F than R. The results indicate that faecal material may be a suitable alternative to rumen liquor but that separate calibrations with in vitro results will be needed.

14. The relationship between gas production from washed and unwashed foods and in situ dry-matter degradability of foods

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The gas pressure transducer technique appears to be a useful alternative to in situ assessment of degradability but results may be affected by the fermentation of the rapidly released $r_1$ fraction. Pre-washing the food in a polyester bag might improve the relationship between total gas production and in situ degradability. The in situ degradation of winter beans, soya-bean meal, rapeseed meal and spring barley was assessed in sheep at 0, 3, 6, 15, 24 and 48 h. One hundred and twenty-five ml bottles containing the test food (100 g dry matter (DMI)) were filled with 90 ml modified Van Soest medium and 10 ml homogenized strained ovine rumen liquor and incubated at 39°C using three bottles per food for unwashed (UW) and washed (W). Total gas production was measured at regular intervals. For UW the overall regression between gas production and degradation was significant ($P < 0.001$) but the degree of fit was poor ($r^2 = 0.65$, residual s.d. = 0.14 g/g). It was poor for spring barley ($r^2 = 0.52$, residual s.d. = 0.13 g/g, P > 0.01) but acceptable for the others ($r > 0.81$, residual s.d. < 0.08 g/g, P < 0.01). For W the overall correlation between total gas production and $r_1$ fraction degradability was no better than for UW ($r^2 = 0.65$, residual s.d. = 0.20 g/g, P < 0.001) with spring barley still being poor ($r^2 = 0.34$, residual s.d. = 0.23 g/g, P < 0.01). Disregarding the 0 h values only improved the fit for spring barley (UW: $r^2 = 0.89$, residual s.d. = 0.02 g/g, P < 0.01; W: $r^2 = 0.75$, residual s.d. = 0.05 g/g, P < 0.001). Removal of the $r_1$ fraction by washing does not improve the relationship between gas production and DM degradability and it is suggested that this is due to the variable relationship between gas productivity and gas production for different chemical fractions of the foods.

15. Relationships between in vitro gas production characteristics and composition of tree leaf fodders from Bolivia, West Africa and Colombia

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Sample of tree leaf fodders (20 from Bolivia, 26 from West Africa and 24 from Colombia) were dried and analysed for crude protein (CP), ash, ether extract, acid detergent fibre (ADF), neutral detergent fibre (NDF), extractable tannins by protein precipitation activity, total phenols and condensed tannins. Samples were then ground using a $n$ size gas production unit. The relationships between in vitro gas production variables and composition were investigated using step-wise multiple regression analysis. Gas production variables investigated were cumulative gas production after 6, 12, 24 and 52 h incubation, the dry-matter disappearance (DMD) after 16 h incubation, and the rate constant ($k$) produced by fitting an exponential curve to the gas production data. ADF and extractable tannins as measured by the total phenols assay were significant in accounting for variability in cumulative gas production at all the times investigated and in DMD. CP was significant only in the 6 h cumulative gas production data. Components important in accounting for variability in $k$ were ash, ether extract, NDF (which was closely related to ADF) and total phenols. The analysis of variance parameters, the source of the samples appeared to affect the relationship between gas production and composition, generally by affecting the relationship between total phenols and gas production. This may have been due to unidentified site-specific components, site-specific differences in phenols or differences in sample preparation. In no case did the compositions measured account for even as much as 0.5 of the variability in gas production, so clearly other parameters were important.