PREDICTION OF INTAKE AND DIGESTIBILITY OF SHEEP DIETS BY NIRS

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Estimation of feed quality and intake by grazing animals is difficult because selective grazing prevents accurate identification of the diet. Near infra-red reflectance (NIR) spectroscopy is a computerised optical technique involving measurement of near infra-red radiation reflected from samples and prediction of chemical composition or other traits (such as intake by sheep) by a regression separately derived from similar material. The technique is rapid, inexpensive, non-polluting and devoid of animal welfare problems. If a statistically satisfactory regression can be developed for any trait, this can be used for prediction without an understanding of the chemistry or physiology involved. Thus, if a regression can be developed permitting prediction of feed quality and intake from the faeces produced from those feeds, NIRS analysis of faecal samples can replace pasture sampling, oesophageal fistulation techniques, total faecal collections or the use of markers.

Twelve sheep, eight months old, weighing 22.4 kg, received three diets, according to a Latin Square, consisting of (T1) ad libitum oaten and lucerne chaff (3:1), (T2) diet T1 plus barley grain at 1.5% LW and (T3) diet T1 plus cottonseed meal (CSM) at 1.5% LW in a conventional intake and digestibility trial. Dry matter digestibilities (DMD) were: T1 601, T2 657 and T3 613 g/kg; chaff and supplement intakes were: T1 944g and 0g; T2 614g and 347g; T3 825g and 377g respectively. The chaff mixture, three mixtures of chaff and barley and three mixtures of chaff and CSM were analysed conventionally and by NIRS; NIRS prediction equations derived previously for hay predicted accurately DM, N and IVDMD of chaff and mixtures with 25% supplement but were less accurate with higher amounts of supplement in the mixture. Calibration equations derived from subsets of faecal samples predicted OM and NDF but not N content of faecal samples derived from the same diet, but not the composition of faeces derived from different diets. Faecal samples collected in the morning were used to predict composition of bulked faecal samples, DMD and DM intake more accurately than afternoon samples. DM digestibility overall was predicted by NIRS analysis of faeces with S.E.V. of 3.24%, which compares favourably with conventional experimental procedures, even though the predictions were derived from small data sets (n=12 to 48).

When the estimates of DMD and DMI were used in a nutritional management model (GrazFeed), results from NIRS agreed more closely with observed intake and digestibility values than results from conventional laboratory techniques. Neither NIRS nor conventional laboratory techniques predicted intake reliably. Since faecal samples can be collected from sheep with no preparation and the analysis is quick and inexpensive, NIRS may be of use in conjunction with nutritional management systems such as GrazFeed in routine formulation of supplemental diets for grazing animals.

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