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Prediction of diet quality in Mongolian livestock with portable near infrared spectroscopy of feces

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Key words : diet quality, feces, Mongolian livestock, near infrared spectroscopy, portable

Introduction Monitoring the nutrition of grazing animals requires knowledge of forage quantity and quality. Selection by grazing animals, especially in rangeland environments, complicates the determination of diet quality. Near infrared reflectance spectroscopy (NIRS) of feces is a non-invasive method for determining diet quality in livestock (Stuth et al 2003, Coates 1998, Landau et al 2006). Heretofore reported only in bench-top laboratory settings, the technology has been recently adapted for application with portable instruments (Tolleson and Stuth 2005). If successful, this adaptation to portable instruments will facilitate extension of the technology into remote areas and developing countries. The objective of this study was to evaluate the ability of portable fecal NIRS to determine dietary crude protein (CP) in forage fed Mongolian livestock.

Materials and methods Diet CP :fecal spectra (DF) calibration pairs (n=63) were created during 7-day feeding trials with mature (60±2.0 kg) sheep (*Ovis aries*, n=7). Each animal received a unique diet during each trial and each animal was used in multiple trials. Diets were offered beginning at ~2% body weight and adjusted to voluntary intake. Diets consisted of hays and locally harvested forages in the Ulaanbaatar area. Near infrared spectra (800 to 1700 nm) were obtained on day 7 fecal samples with an Ocean Optics® NIRS 512 portable spectrometer. Calibration equations were developed using partial least squares regression. To be considered useful in practical animal management situations, fecal NIRS calibration equation RSQ should be greater than 0.80 and the standard error of calibration (SEC) should be less than 2 times the error for duplicates of the reference method. The reference method error for CP in this study was 0.55.

Results Calibration results for portable NIRS predicted diet CP (Figure 1) were: RSQ=0.54, SEC=2.74, F=71.59, and P < 0.0001. Although the regression was significant (P < 0.0001), the RSQ and SEC were not yet acceptable by our evaluation standards. This paper contains only the results of one DF pair study and represents the first use of portable NIRS technology for this purpose. Other DF pair studies are being conducted in Mongolia and further refinement of the technique continues.

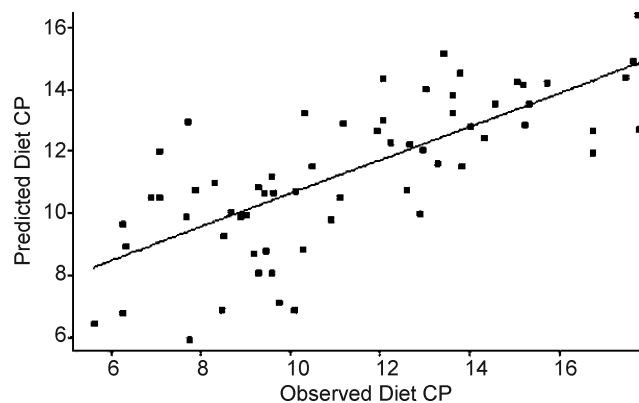


Figure 1 Observed versus portable fecal NIRS predicted diet CP in Mongolian sheep.

Conclusion Dietary CP in forage fed Mongolian livestock can be determined from feces with a portable NIRS instrument, however further work is needed before this technique can be applied in practical management situations.

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