

Validation of faecal NIRS for monitoring the diet of confined and grazing goats

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Introduction Goats are used for brush control and ecological management of Mediterranean grazing lands. Farmers are willing to cooperate with communities but they need an easy method to evaluate the daily intake of nutrients. A calibration of the chemical attributes of goats' diets was set-up, based on faecal near infrared (NIR) spectra (Landau *et al.*, 2004; Table 1). The accuracy of this methodology was estimated by using the standard error of cross-validation (SECV), which represents the variability in the difference between predicted and reference values when the equation is applied sequentially to subsets of data from the calibration data set. This procedure is justified in situations with calibration samples that are randomly selected from a natural population, but may give over-optimistic results, in particular if data are replicated. The standard error of prediction (SEP) represents the variability in the difference between predicted and reference values when the equation is applied to an external (i.e., not used in any step of the calibration) validation data set. (Naes *et al.*, 2002). The aim of the present study was to test the robustness of predicting dietary CP, *in vitro* dry matter digestibility (IVDMD), and NDF percentages in goats' diets, using faecal samples totally external to calibrations.

Materials and methods A validation data set was constructed by merging data including confined Saanen (n=36) and grazing Damascus and Sarda (n=8) goats. Predictions were made on faeces from experiments published prior to the establishment of calibrations and compared with actual dietary values. Accuracy was assessed from the slope and bias of regressions and from paired t-tests between actual and predicted values.

Table 1 Faecal NIRS calibrations (Landau *et al.*, 2004) of chemical dietary attributes (on DM basis) in Israeli Damascus goats. Diets consisted of hay and concentrates (n=60) and browse from up to three different species (n=83)

Constituent	Mean	Range	R ²	SECV
CP	12.2	7.7-16.9	0.98	0.53
NDF	37.9	28.5-50.1	0.94	1.53
IVDMD	60.0	41.3-80.0	0.98	1.98

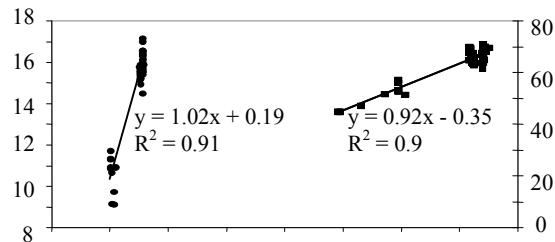


Figure 1 Actual (x-axis) and predicted values for dietary CP (●, left y-axis) and IVDMD (■, right y-axis) in the external validation set

Results Dietary CP was predicted with high linearity (R²=0.91) and accuracy (slope 1.02, bias 0.2%, Figure 1). Predicted values of dietary CP differed from actual values for confined, but not grazing goats. The validation of dietary IVDMD was linear (R²=0.90), but the slope differed from 1, and dietary IVDMD was significantly underestimated (Table 2). Dietary NDF was underestimated to a greater extent in grazing than in confined goats.

Table 2 Means of actual and predicted values for dietary percentages (on DM basis) of CP, NDF and IVDMD

Mean	CP (range 9.4-15.7%)		NDF (range 41.3-47.7%)		IVDMD (range 31.8-74.2%)	
	Actual	Predicted	Actual	Predicted	Actual	Predicted
Grazing	10.1	10.7	42.4 ^a	38.4 ^b	57.0 ^a	52.0 ^b
Confined	15.3 ^a	15.8 ^b	41.0 ^a	40.0 ^b	73.0 ^a	66.6 ^b

Separately for confined and grazing goats, means with different superscripts letters differ (paired t-test, P<0.05)

Conclusions Even though systemic bias needs correction, the present validation suggests that faecal NIRS predictions, in particular of dietary CP percentage, are sufficiently accurate for decision-making under farm conditions.

References

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