



Near-infrared spectra from faeces as a proxy of enteric methane emissions and intake in beef cattle

INTRODUCTION

Near infrared spectroscopy (NIRS) from cattle faeces could be used as a phenotyping method to predict dry matter intake (DMI) as well as enteric methane emissions (ECH₄). However, results from the literature, mainly related at dietary level, are inconclusive. Several reasons, including the length of the measurement period for determining the phenotypes to be predicted, the reference methods and the variability of the faecal composition could partially explain these results.

OBJECTIVE

The objective was to determine the ability of NIRS to estimate individual DMI and ECH₄ in beef cattle from faecal spot according to the length of the measurement period.

MATERIALS AND METHODS

- Experimental design: 288 charolais heifers were fed *ad libitum* a diet based either on grass silage or on corn silage with 0.5 or 1 kg concentrate per day.
- Faecal sampling: A faecal sample (morning spot) was obtained from all the heifers at the end of the experimental period.
- Dry matter intake (DMI): The average daily DMI values, expressed in g/kg metabolic weight (BW^{0.75}) over the 2, 4 and 5 days preceding the date of the faecal sampling were calculated,
- Methane emissions (g/d): were quantified daily by the GreenFeed® method throughout 7 consecutive weeks (approximately, 20 spot measures of CH₄ per week). CH₄ data were averaged over the 5, 6 and 7 weeks prior to the faecal sampling date.
- VIS-NIR spectra: Faeces reflectance spectra were obtained between 400 and 2500 nm.
- Models development: Partial least square calibration models were developed. Models were evaluated according to the standard error of cross-validation (SECV) and the coefficient of determination of cross-validation (R²CV).

RESULTS

Standard error of cross validation (SECV) and determination coefficient (R²CV) values of faecal NIRS models for dry matter intake (DMI; g/kg BW^{0.75}) and methane emissions (CH₄, g/d) of faecal samples in beef cattle used in the database .

	DMI			CH ₄		
	2d	4d	5d	5w	6w	7w
SECV	6.63	7.09	7.02	18.93	17.63	18.94
R ² CV	0.62	0.69	0.43	0.52	0.61	0.66

2d: 2-day average. 4d: 4-day average 5d: 5-day average 5w: 5-week average 6w: 6-week average 7w: 7-week average

CONCLUSION and IMPLICATIONS

The results of this study show the potential of faecal NIRS for large-scale phenotyping of DMI and ECH₄ in beef cattle. In our experimental conditions, the use of 2-day average values for DMI and 6-week average for ECH₄ are recommended. These results deserve to be confirmed with a wider range of diets in beef and dairy cattle.

