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Two techniques to measure herbage intake of grazing dairy cows

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Introduction Dry matter intake (DMI) is a major factor influencing milk production in dairy cows. The level of accuracy with which intake is measured is highly variable and dependant on the method used. Smit et al. (2005) concluded that the n-alkane technique is the best method to estimate herbage intake of individual grazing animals.

Materials and methods Seventy-two spring calving Holstein Friesian dairy cows were randomly assigned to a six treatment (n=12) grazing study for a 77 day period (20 Feb -7 May). The treatments were: (L0) 13 kg dry matter (DM)/cow daily herbage allowance (DHA)+0kg conc.; (L3) 13kg DM/cow DHA+3kg DM/cow conc.; (L6) 13kg DM/cow DHA+6kg DM/cow conc.; (H0) 17kg DM/cow DHA+0kg conc.; (H3) 17kg DM/cow DHA+3kg DM/cow conc.; (H6) 17kg DM/cow DHA+6kg DM/cow conc. Each group grazed separately for the duration of the experiment. Fresh herbage (>4cm) was allocated daily. DMI was measured on three occasions during the experimental period-weeks 3, 6 and 10 using the n-alkane technique as described by Dillon et al. (1989). The alkane concentration of the dosed pellets, faeces, herbage and concentrate were determined and used to calculate grass DM intake (GDMI) of each animal. The HR measurements were averaged across weeks 2, 3, 5, 6, 9 and 10 of the experiment. Herbage mass and sward density were measured twice weekly by cutting two strips per grazing area. Pre and post-grazing sward heights were measured daily using an electronic plate-meter. Herbage removed was calculated using the following equation:

(Pre-post height) × density × area/ (no. cows × 10000). The n-alkane intakes were analysed using covariate analysis. The variables included were milk yield and bodyweight. HR data were analysed using analysis of variance. The factors included in both models were DHA, conc. level and their interactions. Linear regression analysis was used to determine the degree of association between the two methods when estimating GDMI.

Results and discussion Results presented are averaged for the three intake measurement periods (Table 1). DHA (P<0.001) and concentrate (P<0.01) had a significant effect on GDMI with both methods. Figure 1 shows the association between the two methods.

Conclusions Daily measurements of pre and post-heights will allow more frequent estimates when using the HR method. Pre-height should not be excessively high, as this may reduce the accuracy of plate-meter readings if herbage is lodging. A high level of herbage utilisation is recommended for accurate results (range 1.09-0.84 in this study). The HR method is useful when rapid estimates of GDMI are required. The n-alkane technique is recommended for estimation of individual animal herbage intakes.

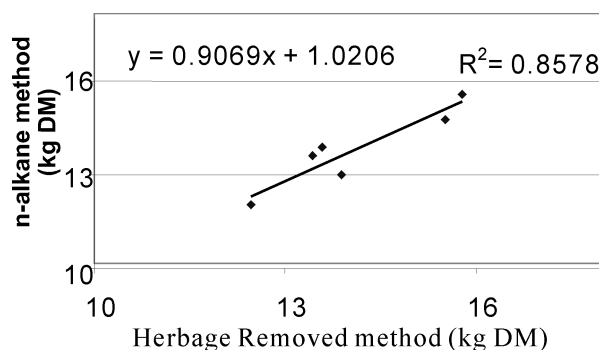


Figure 1 Linear regression equation to determine the degree of association between the two methods for estimating grass dry matter intake.

Table 1 Sward variables and grass dry matter intakes based on group averages for three intake measurement periods (between 6 March and 30 April).

	L0	L3	L6	H0	H3	H6	Rse	DHA	Conc.
Pre height (cm)	9.7	9.7	9.7	9.8	9.8	9.8	0.30	NS	NS
Post height (cm)	3.5 ^a	3.8 ^b	4.3 ^c	4.4 ^{cd}	4.7 ^d	5.0 ^e	0.12	***	***
Density	229	229	229	235	235	235	3.69	NS	NS
Herbage removed (kg DM)	13.9 ^a	13.0 ^b	12.0 ^c	15.6 ^d	14.8 ^d	13.6 ^{ab}	0.30	***	***
n-Alkane GDMI (kg DM)	13.6 ^a	13.9 ^a	12.5 ^a	15.8 ^b	15.5 ^b	13.4 ^a	0.76	***	**
(n-alkane-HR method) (kg DM)	-0.3	0.9	0.5	0.2	0.7	-0.2			

Herbage removed refers to that measured using the HR method; n-Alkane GDMI=Grass dry matter intake measured using the n-alkane technique. ^{abc} values in the same row not sharing a common superscript are significantly different.