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BRIEF COMMUNICATION

The combination of the *n*-alkanes and the ¹³C methods as a new tool for estimating individual DM intakes of pasture and maize silage by grazing dairy cows

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INTRODUCTION

It is very difficult to measure DM intakes by individual grazing animals, particularly if these animals are being supplemented as a group, and the individual intakes of both pasture (P) and supplement are of interest. When the supplement is maize silage (MS), the difference in the proportions of the stable isotope ¹³C between temperate P and MS could be combined with the n-alkane method for this purpose. The experiment described here was conducted to test this method and also to measure the variation between individual cows in the amount of MS eaten daily.

MATERIALS AND METHODS

Twelve early-lactating cows were selected from a commercial herd of 48 autumn-calving cows and blocked into pairs according to milk yield, lactation length, lactation number and live weight. Within each pair, cows were randomly assigned to two treatments: supplemented, S (4 kg MS DM/cow/day once daily in concrete bins) or not supplemented, NS. Another 8 cows were randomly selected from the rest of the herd in order to obtain additional measurements for individual cows. On each day the NS cows were separated from the herd, while the S cows were allowed to eat the MS for approximately 1.5 h after the morning milking. The S cows then rejoined the NS cows to graze as one herd. Cows grazed together on perennial ryegrass-based pasture (*in vitro* organic matter digestibility, IVOMD = 74.1%, crude protein = 26.3%, neutral detergent fibre = 39.8%) during the rest of the day. Pasture DM intake (PDMI) was estimated by the n-alkanes method (Dove and Mayes, 1991) while the proportion of faecal DM from each feed source was estimated by the δ¹³C method (Jones *et al*., 1979). Estimations were based on individual faecal samples collected from the paddocks during two 5-day periods. Intake estimates, together with the IVOMD of each feed source, were combined in an iterative process in which values for DM intake of P and MS corrected each other until further corrections resulted in changes of intake <0.001 kg. In addition, herd averaged intakes of P were estimated by measuring herbage mass (plate meter) immediately before and after each grazing while those of MS were estimated by weighing the silage offered (daily) and refused (once at the end of each 5-day period) in the bins.

RESULTS AND DISCUSION

Averaged across the two experimental periods, S and NS cows ate similar amounts of pasture (*P*>0.05), which resulted in a large additive effect of the supplement on the total daily DM intake (Table 1). Average MS DM intake for the 14 cows (6 paired + 8 not-paired), estimated by the combination of alkanes and δ¹³C methods was 2.94 kgcow⁻¹day⁻¹, which compared to 3.8 kg measured by weighing the silage offered and refused. This discrepancy could be due to real differences between the mean consumption of the whole herd (42 cows) and that of the sampled group of cows (14 cows), or to an underestimation of the individual intakes. The latter is less probable because preliminary results from a later full validation of the methodology against known amounts of P and MS intake showed a very good agreement between actual and predicted values (unpublished data). In addition, silage intake could be overestimated because some silage was inevitably dropped out of the bins by the cows, and the refusals inside the bins were collected and weighed only at the end of each 5-day period.

TABLE 1: Average daily DM intake of pasture and maize silage by individual cows.

Intake (kg DM cow⁻¹day⁻¹)	Treatment[1]				Whole herd[2]
	S	NS	SEM	*P*	Mean ± SD
Pasture	11.9	12.1	0.47	0.76	13.2 ± 0.49
Maize silage	2.6	0.0	0.12	<0.01	3.8 ± 0.25

[1] S= supplemented, NS =not supplemented (n=6)
[2] Pasture: from pre/post grazing herbage mass; Maize silage: from difference between silage offered and refused.

Considerable variation (Figure 1) was observed among individual cows in their daily levels of MS DM intake (range 1.2 to 5.1 kg cow⁻¹day⁻¹; CV = 36%), but MS DM intake was not correlated to milk yield (R²= 0.01). Other authors had previously found large variations between individual intakes of supplement when sheep were fed as a group (Curtis *et al*., 1994; Holst *et al*., 1994).

CONCLUSION

It is concluded that the combined use of alkanes and ^{13}C methods can be a new tool for estimating the individual intake of pasture and maize silage when grazing cows are supplemented as a group. The methodology could also be used to measure individual intakes of maize grain (or any other supplement which originates from C_4 plants) by cattle grazing temperate pastures.

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FIGURE 1: Individual values for maize silage DM intake for the 20 experimental cows estimated by the combination of n-alkanes and $\delta^{13}C$ methods. Black columns are the 6 S cows paired to the 6 NS cows (arrow). Bars are SE.