The Effect of Inclusion of a Range of Supplementary Feeds on Herbage Intake, Total Dry Matter Intake and Substitution Rate in Grazing Dairy Cows

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The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

Proceedings Editor: D. A. McGilloway

Publisher: Wageningen Academic Publishers, The Netherlands

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Keywords: forage maize, grazing, whole crop wheat, dairy cows

Introduction The milk production potential of dairy cows has increased substantially over the past two decades. This development presents new challenges for managing dairy cows during grazing, particularly where the objective is to maximise the proportion of energy in the diet derived from forage. The objective of the current study was to explore supplementation strategies to maintain high total forage intakes from grazed grass supplemented with alternative forage supplements in dairy cows during the grazing season. A second objective of the study was to examine the effect of supplement on substitution rate (SR) and milk yield response.

Materials and methods Twenty-four spring calving dairy cows were used with five periods, each of four weeks duration, and six treatments in a partially balanced, change-over design experiment commencing on 9 May. The treatments were based on a range of supplements including: maize silage (MS); whole crop wheat silage (WS); grass silage (GS); rapidly available energy concentrate (RC); slowly available energy concentrate (SC); and a control which was unsupplemented (U). The components of the SC concentrate were sugar beet pulp, citrus pulp, maize gluten feed, soyabean meal, soya hulls, rape meal, vitamin/minerals, molasses, Megalac and urea included at 150, 190, 125, 175, 242, 25, 40, 30, 20 and 3 g/kg fresh respectively. The RC concentrate included barley, wheat, soyabean meal, sucrose, wheat feed, rape meal, vitamins/minerals and molasses at 200, 255, 200, 125, 100, 50, 40 and 30 g/kg fresh respectively. Forage supplements were offered indoors *ad libitum,* for 2h after the morning milking. Cows on concentrate treatments (RC + SC) received the allocated concentrate in the milking parlour twice daily (4.5 kg fresh/cow/d). The concentrate supplemented and unsupplemented cows returned to grazing immediately, whereas cows receiving forage supplements were retained after morning milking to access the allocated forage supplement using Calan gates. All cows were communally grazed in a rotational system with a target residual sward height of 5-6 cm, with cows offered a new paddock daily after each pm milking. Herbage intake was recorded using the n-alkane technique.

Results Mean herbage intake, supplement intake and total dry matter intake (DMI) data are presented in Table 1. Of all the supplements used in the present study, the MS treatment resulted in a significantly higher ($P<0.001$) supplement DMI than any other treatment, resulting in the highest total DMI of all the forage supplement treatments. The MS supplemented cows however, had a significantly lower ($P<0.001$) herbage intake than any other treatment. The cows offered the concentrate treatments had the greatest herbage intake of all the supplemented cows and achieved the highest total DMI. Unsupplemented cows on the control treatment had a significantly higher herbage intake than all other treatments except SC. Substitution rate, defined as the reduction in herbage DMI (kg) per kg of supplement DMI, was lower with the concentrate supplemented cows compared to all forage supplemented cows. There was no difference in SR between the GS, MS and WS supplemented cows. The RC supplement incurred a numerically higher SR than the SC.

Table 1 Effect of supplement treatments on herbage and supplement intake of grazing dairy cows

		Forage			Concentrate			
	Control	Grass silage	Maize silage	Wheat Silage	Rapid energy	Slow energy	S.e.d.	Sig.
Supplement DMI (kg DM/d)		3.0	6.3	3.6	3.9	3.9	0.37	***
Herbage intake (kg DM/d)	12.9	11.2	8.9	11.0	11.8	12.2	0.50	***
Total DMI (kg DM/d)	12.9	14.2	15.3	14.7	15.7	16.1	0.50	***
Substitution rate		0.56	0.63	0.53	0.28	0.18		

Conclusions The results of the present study suggest that all the forage supplements incurred a similar SR of between 0.5-0.6 kg reduction in herbage DMI for every kg of supplement DMI. The overall level of herbage intake was low, possibly indicating limited herbage availability and therefore influencing the substitution rate. No differences in herbage DMI, total DMI or SR were observed between concentrate types. Of the forage supplements offered, MS is the more favourable to obtain a high total DMI, due to its higher intake potential.