Effect of supplement level on herbage intake and feeding behaviour of Italian Brown cows grazing on Alpine pasture

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RIASSUNTO – Effetto del livello di integrazione sull'ingestione di erba e sul comportamento alimentare di vacche Brune al pascolo alpino. *Per due anni consecutivi, 8 vacche di razza Bruna Italiana nel primo anno e 6 nel secondo, sono state mantenute su un pascolo alpino, per 5 settimane. Gli animali sono stati divisi in due gruppi omogenei e sottoposti a due diversi livelli di integrazione: 4,8 kg SO/d (livello alto) e 2,4 kg SO/d (livello basso) nel primo anno; 4,8 kg SO/d (livello alto) e 1,6 kg SO/d (livello basso) nel secondo anno. Scopo della prova era quello di verificare l'effetto del diverso livello di integrazione al pascolo sull'ingestione di erba, sulla produzione di latte e sul comportamento alimentare. L'aumento del livello di integrazione si è tradotto in un aumento dell'ingestione totale e della produzione di latte il primo anno e in una marcata diminuzione dell'ingestione di erba a fronte di consumi e produzione confrontabili il secondo. I tempi di pascolamento e di ruminazione sono risultati coerenti con i consumi di erba stimati.*

Key words: grazing dairy cows, supplement level, herbage intake, feeding behaviour.

INTRODUCTION – Summer grazing of dairy cows on mountain pastures often leads to a fall in production or in body condition when the pasture is not adequately supplemented with concentrate feeds (Malossini *et al.*, 1992; Bovolenta *et al.*, 1998). An abundant use of concentrates may result into a reduction of herbage intake according to a substitution rate mechanism (Faverdin *et al.*, 1991). The aim of this trial was to evaluate the effect of the supplementation level on herbage intake, milk yield and feeding behaviour (time spent grazing and ruminating) of dairy cows at pasture, combining the use of an electronic bitemeter and a double marker method for the estimation of intake.

MATERIAL AND METHODS – Eight Italian Brown cows in a first trial (year 2002) and 6 in a second trial (year 2003), were maintained, day and night, on alpine pasture (Malga Juribello, 1800-2200 m, Paneveggio – Pale di San Martino Natural Park, Trento, Italy) for 5 weeks (1 July – 8 August), in relative low stocking conditions (0.7 cows/ha in the first year and 0.4 cows/ha in the second). The pasture was characterized by a situation of transition between *Nardion* and *Poion alpinae* (Orlandi *et al.*, 2000). The animals (about 7 months of lactation at the start of the trials) were divided, in each year, in two homogeneous groups submitted to different levels of supplement (based on maize, sugar beet pulp and extruded soybean): 4.8 kg OM/d (high level) and 2.4 kg OM/d (low level) in the first trial; 4.8 kg OM/d (high level) and 1.6 kg OM/d (low level) in the second trial. The concentrate was administered twice a day, in equal amounts at the milking. The animals were milked on pasture with a mobile milking device. In each year, at the end of the experimental period, the following measurements were made: herbage intake, milk production and composition, feeding behav-

iour. Herbage intake was estimated by the n-alkane method (Mayes *et al.*, 1986), dosing the animals for 10 days with 500 mg of C_{32} and collecting, during the last 4 days, individual samples of faeces and consumed herbage. The samples were analysed by GC for their content of dosed C_{32} (external marker) and natural C_{31} (internal marker). Individual milk samples were collected and analysed for their composition; the latter was used to calculate the energy corrected milk (ECM; Bickel, 1988). Feeding behaviour (i.e. time spent grazing and ruminating), was recorded, in the 24 hours, for 3 consecutive days, with an electronic bitemeter system (Mastilogger, Starel, La Spezia, Italy). Each animal was equipped with a pneumatic sensor positioned under the jaw; each jaw movement induced a pressure variation and was converted into binary notation by an electronic transducer and recorded by the aid of a data logger.

RESULTS AND CONCLUSIONS – In the first trial (Table 1) the increase of supplement from 2.4 to 4.8 kg OM/d leaded to a non significant reduction of herbage consumption, equal to 0.4 kg OM/d, and then leaded to an increase in total intake of 2 kg OM/d. It followed an increase of 15% in ECM.

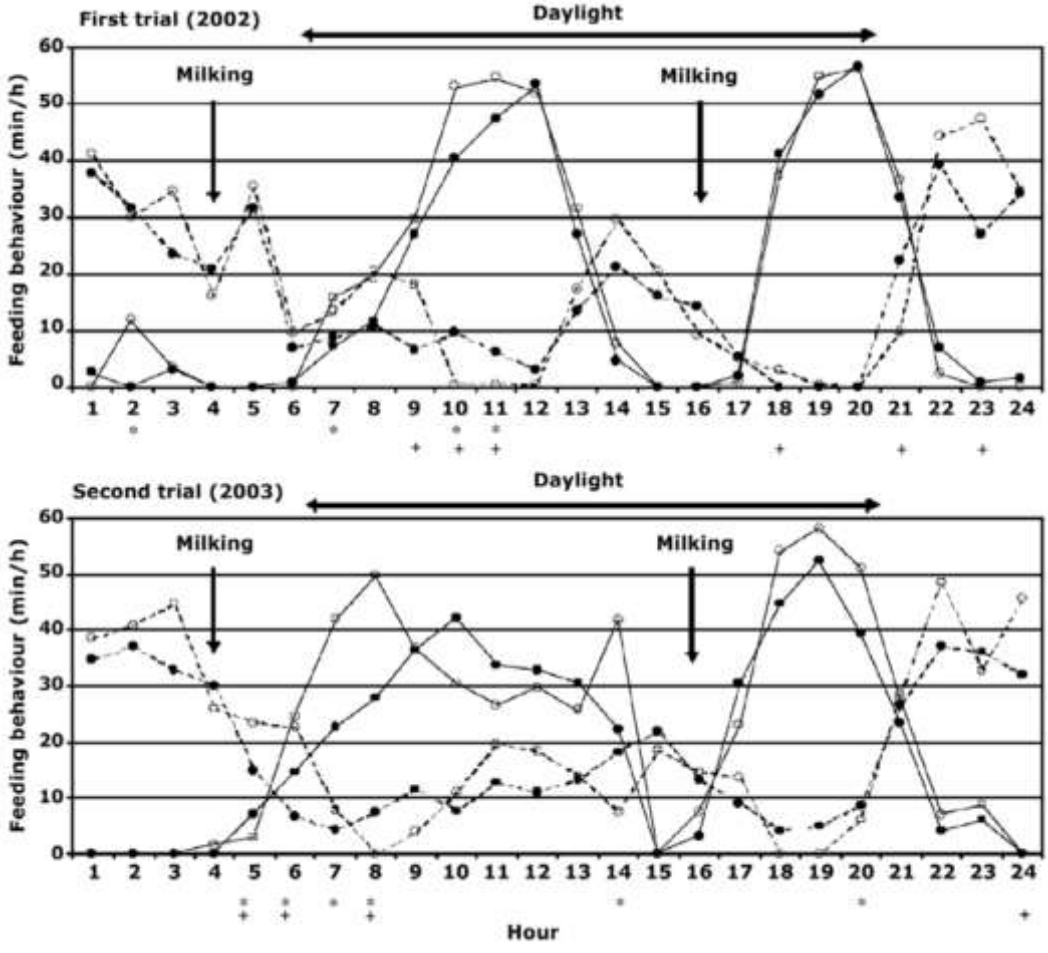
Table 1. Intake, milk yield and feeding behaviour of cows.

	First trial			Second trial		
	Supplement			Supplement		
	Low	High	ES	Low	High	ES
Intake (kg OM/d)						
Herbage	11.6	11.2	0.84	15.1[a]	12.3[b]	1.12
Supplement	2.4	4.8	-	1.6	4.8	-
Total	14.0[b]	16.0[a]	0.84	16.7	17.1	1.12
Milk yield (kg ECM/d)	14.8[b]	17.1[a]	1.13	14.5	15.0	1.35
Feeding behaviour (min/d)						
Grazing time	457[a]	419[b]	37.7	546[a]	471[b]	64.6
Ruminating time	440	390	62.5	483[a]	432[b]	40.1

a, b: $P<0.05$.

About feeding behaviour, grazing and ruminating time were respectively 38 min/d and 50 min/d higher in the low level group. In the second trial, providing a lower stocking density and a larger supplementation difference, in the low level group herbage intake was 2.8 kg OM/d higher than that observed in the high level group. The substitution rate was much higher in the second trial in comparison with the first one (0.87 and 0.17 respectively) thus leading to a substantial balancing of total organic matter intake, and consequently of milk production (Minson, 1990). Grazing and ruminating time was sufficiently coherent with herbage consumption; the animals of low level group grazed 75 minutes and ruminated 51 minutes more than the other group.
As expected, grazing was the main diurnal activity (trial 1: 88%, and trial 2: 91% of grazing time) which was replaced by rumination at night. The hourly pattern of active grazing behaviour (Figure 1) shows that the main morning grazing cycle is clearly affected by supplementation level: cows receiving the higher supplement level reach the grazing activity peak two hours later. In the second trial the afternoon grazing cycle has been affected, as well the effect being less evident however. Ruminating activity differences between experimental groups were not related to a daily pattern; the differences however were statistically significant in correspondence with some hours.
In conclusion the methods utilized seem to provide coherent information on feeding behaviour of dairy cow at pasture and allow further investigations on its quantitative aspects and its temporary patterns. Results confirm that concentrate supplementation may seriously reduce herbage intake of grazing dairy cows.

Figure 1. Hourly records of grazing (—) and ruminating (---) time, for Low (o) and High (•) supplementation.



*, +: P< 0.05; *: grazing, +: ruminating.

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REFERENCES – **Bickel**, H., 1988. Fat-corrected milk (FCM), an inaccurate and confusing term. Liv. Prod. Sci. 18:311-313. **Bovolenta**, S., Ventura, W., Piasentier, E., Malossini, F., 1998. Supplementation of dairy cows grazing an alpine pasture: effect of concentrate level on milk production, body condition and rennet coagulation properties. Ann. Zootech. 47:169-178. **Faverdin**, P., Dulphy, J.P., Coulon, J.B., Verité, R., Garel, J.P., Rouel, J., Marquis, B., 1991. Substitution of roughage by concentrates for dairy cows. Liv. Prod. Sci. 27:137-156. **Malossini**, F., Bovolenta, S., Pradi, P., Piras, C., 1992. Effetto dell'alpeggio sulla produzione di latte di bovine di razza Bruna. Zoot. Nutr. Anim. 18:259-265. **Mayes**, R.W., Lamb, C.S., Colgrove, P.M., 1986. The use of dosed and herbage n-alkanes as markers for the determination of herbage intake. J. Agric. Sci. 107:161-170. **Minson**, D.J., 1990. Forage in ruminant nutrition. Academic Press, Inc., San Diego, California, USA. **Orlandi**, D., Clementel, F., Scartezzini, F., Floris, A., 2000. Caratterizzazione e cartografia dei pascoli di una malga alpina (Malga Juribello - Trento). Comunicazioni di ricerca ISAFA 2000. 1:1-24.