Effects of reducing access to food on intake and feeding behaviour of loose-housed dry Charolais cows

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Note

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Abstract — The food intake and feeding behaviour of four groups of loose-housed dry Charolais cows offered hay ad libitum were compared according to the number of mangers available for the group (one or two cows per manger) and to the composition of the group. Two groups had six dry cows (trial 1) and were considered as homogeneous according to nutritional requirements. Two groups had three dry and three lactating cows (trial 2) and were considered as heterogeneous according to nutritional requirements. In trial 1, the intake, the eating duration, the number of long meals and the synchronisation of the eating activity decreased with competition for food. In trial 2, dry cows increased their intake with competition by 1.2 kg DM·d^{-1}.

beef cow / food intake / feeding behaviour / group feeding / competition for feeding

Résumé — Effets de la réduction du nombre d'auges sur le niveau d'ingestion et le comportement alimentaire de vaches Charolaises taries conduites en stabulation libre. Les quantités ingérées et le comportement alimentaire individuels de vaches Charolaises taries ont été comparés selon le niveau de compétition alimentaire et la composition du groupe : 2 groupes homogènes de 6 vaches taries (essai 1) et 2 groupes hétérogènes composés chacun de 3 vaches taries et de 3 vaches en lactation (essai 2). Les vaches étaient nourries au foin à volonté, distribué deux fois par jour dans 6 puis dans 3 auges pour chaque groupe. Dans l'essai 1, le niveau et la durée d'ingestion, le nombre de grands repas et la synchronisation de l'activité alimentaire ont diminué en situation de compétition. Dans l'essai 2, la compétition à l'auge a engendré une augmentation des quantités ingérées d'1,2 kg MS·j^{-1} pour les vaches taries.

vache allaitante / niveau d'ingestion / comportement alimentaire / alimentation en groupe / compétition alimentaire

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1. INTRODUCTION

Within-group diversity in nutritional requirements of loose-housed cows may add to the constraints of social hierarchy, available space and overall access to food. The aim of this study was to analyse the adaptation of feeding behaviour by loose-housed dry Charolais cows, according (i) to the number of mangers available to the group (one manger per cow vs. one manger per two cows) and (ii) to the composition of the group. The hypothesis was that when having to compete for access to food, lower-ranking cows would vary their meal times and feeding rates, more than high-ranking animals, and that for those with lower nutritional needs (less motivation to eat), feed intake would be reduced.

2. MATERIALS AND METHODS

Two groups of six dry cows were used in trial 1 and two groups of six cows, each comprising three dry and three lactating cows, were used in trial 2. The trial 1 lasted 7 weeks, from 19 November 1997. The six cows in each group had access to six mangers for three weeks, and then three mangers for four weeks. The trial 2 lasted 11 weeks, from 9 February. The six cows in each group had access to six mangers for five weeks, and then three mangers for six weeks. For each trial, the treatments were applied simultaneously in both groups, assuming that (i) increasing competition has not the same effect as decreasing competition and (ii) the period effect induced by the evolution of physiological state is negligible for dry cows. In both trials, cows were fed with the same semi-upland natural grassland hay dispensed ad libitum twice a day (10.00 and 16.00 h). The hay was placed into individual mangers and automatically weighed by compression type load cells. Each access was fitted with a loop which energized the transponder of any cow feeding at the manger [4]. Different variables were calculated from the files generated by the automatic measuring system. These variables were (i) the individual intake level (kg DM·cow^{-1}·d^{-1}) and (ii) variables describing feeding behaviour, namely eating duration (min·cow^{-1}·d^{-1}), rate of eating, number of daily meals and time spent eating per hour (min·h^{-1}). Synchronisation of eating was calculated every minute for each cow from the number of cows eating simultaneously. The social rank of each cow in the group was assessed by continuous video monitoring for five-day periods.

3. RESULTS

The main results are summarised in Table I.

3.1. Competition according to within-group homogeneity (trials 1 and 2)

Mean's intake was 13.8 and 11.9 kg DM for dry cows on average overall the trials 1 and 2, respectively, in accordance with the difference in average body weight (+80 kg in trial 1). When the group had access to only 3 mangers rather than 6 mangers, the cows ate 0.7 kg DM less ($P < 0.001$) and 1.2 kg DM more ($P < 0.05$), respectively in homogeneous (trial 1) and heterogeneous (trial 2) groups. They spent 31 min less eating in homogeneous groups when there was no difference in heterogeneous groups. The number of short meals (< 1 h) increased, the number of long meals and the synchronisation of eating decreased with competition in both types of groups. Dry cows increased their eating activity by 38 and 31% from 23.00 to 07.00 h, respectively in trial 1 and 2. With one manger per cow, two intake peaks of time spent eating were observed in the three hours following each distribution, with maximum values of 30 to 35 min·cow^{-1}·h^{-1}. With one manger for two cows, no peaks were observed, and the eating activity remained at 20 min·cow^{-1}·h^{-1} from 10.00 to 24.00 h.

Table I. Effects of competition (number of mangers available: 6 vs. 3) and composition of groups (only dry cows vs. [dry+lactating] cows) on intake and feeding behaviour for group-fed dry Charolais cows (mean ± s.e.d.).

	Trial 1			Trial 2		
Competition (nb mangers)	6	3	*F*-test	6	3	*F*-test
Intake (kg DM·cow^{-1}·d^{-1})	14.1 ± 1.5	13.4 ± 1.6	***	11.4 ± 1.4	12.6 ± 1.9	*
Eating duration (min·cow^{-1}·d^{-1})	290 ± 33	259 ± 35	***	287 ± 36	274 ± 19	
Rate of eating (g DM·min^{-1})	49 ± 6	52 ± 6		40 ± 8	46 ± 8	
Number of short meals[1]	9.1 ± 2.2	10.5 ± 1.9	**	9.2 ± 3.0	10.9 ± 2.9	*
Number of long meals[1]	1.1 ± 0.4	0.8 ± 0.3	**	1.0 ± 0.3	0.8 ± 0.2	
Synchronisation of eating[2]	2.7 ± 0.1	2.2 ± 0.2	***	2.1 ± 0.2	1.7 ± 0.1	***

[1] Short meals: < 60 min; long meals: > = 60 min.
[2] Number of cows eating at the same time.

3.2. Competition according to social rank (trials 1 and 2)

With no competition, the animals were perfectly synchronised, except after the hay distribution at 16.00 h when the intake peak of the low-ranking cows differed slightly to that of the dominant cows. With competition, eating activity was distributed much more regularly throughout the day, especially for the lowest-ranking cows in trial 2, for which no peak was observed. The highest-ranking cows displayed a peak of activity after the afternoon distribution of hay, especially for those in trial 2. They had also a lower activity than the others between midnight and 06.00 h.

4. DISCUSSION

The results support the hypothesis that competition at the manger causes a greater fractioning of feeding activity irrespective to the group composition and to the physiological state. In heterogeneous groups, there was an increase in intake rate for cows with lower nutritional needs (i.e. dry cows) only with competition, and not without competition. Thus, a leading effect seemed to be initiated in situation with competition. The modification of intake and parameters of feeding behaviour for dry cows can be explained by their low motivation to eat, and in particular to move to the manger to do so [1]. The fractioning of their feeding activity caused by the group feeding may, however, have caused them to increase their intake level even further when competing. The low-ranking cows took more short meals than the dominant ones, consistent with the observations made on groups of bulls and steers fed from a single feeder [3]. The mechanisms of individual adaptation of feeding behaviour in the groups composed of cows at different physiological states are therefore linked primarily to the nutritional needs of the cows rather than to their social rank. This is consistent with the conclusions of Friend et al. [2] obtained with dairy cows managed in socially stable groups.

5. CONCLUSION

When competing for food in homogeneous groups, dry cows decreased their

intake, their eating duration and they fractionated their feeding activity. When competing for food in heterogeneous groups, dry cows did not modify their daily feeding duration on average. They increased their intake level (+10%), the number of short meals per day (+15%) and their night feeding (+31%). Daily feeding activity was more evenly distributed with one manger per two cows than with one manger per cow, with the disappearance of feeding duration peaks following hay distribution. The most dominant cows with high needs (i.e. lactating cows) were the least responsive to the competition.

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