

Behaviour patterns of dairy cows

The influence of different traffic systems in automatic milking

The application of automatic milking has had far-reaching effects on cow behaviour. A first investigation looked at how feeding and milking behaviour could be optimised through applying different traffic or cow movement control systems (Landtechnik 4/2001). As a continuation, this investigation determines whether and how the investigated traffic forms affect behaviour patterns of a dairy herd. In particular, the use of the different function areas were analysed.

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Keywords

Automatic milking system, cow traffic, animal behaviour

Literature

Literature details are available under LT 02415 via Internet at <http://www.landwirtschaftsverlag.com/landtech/local/fliteratur.htm>

The introduction of automatic milking systems means that for the first time cows can be milked according to their own requirements over 24 hours of the day. To achieve optimum milking frequency by simultaneously higher feed intake different systems of controlling cow movements can be applied. In the investigation below it is shown that through applying a selective controlled traffic system many advantages of free and controlled systems could be combined. The aim of this investigation continuation was the determination of the effects of different traffic forms on the behaviour of the cows and especially in this case their use of the different function areas.

Investigated traffic forms

The trials were conducted in three-row naturally ventilated barn from Grub Experimental Farm Administration with a single-box Lemmer-Fullwood milking plant. Average performance of the 48 – 50 cow Fleckvieh herd was around 7000 kg/lactation. Traffic forms investigated were „free traffic“, „simple controlled traffic“ and „selective controlled traffic“.

Trials lasted 12 days in each case with a re-adjustment period of at least six weeks between the variants. Two decentral selection gates for the variant „selective controlled traffic“ were steered by the automatic milking system in such a way that a cow could no longer pass through the gates after the automatic milking system had given her the status „entitled to be milked“. A detailed description of the investigation is available in

[1] and the results so far from these trials are summarised in *table 1*.

The division of the herd and other details was captured over the entire 12-day trial period in each case by four highly-sensitive black/white video cameras, thus making it continuously possible to record influence factors and the number of animals in the respective function areas every half hour. This time pattern was chosen because it was shown in a daily test assessment that a shorter gap between evaluations (10 min) gave no further information.

Lying behaviour

With all three traffic systems the herds showed a very similar behavioural pattern (*fig. 1*). A pronounced resting phase in the night (max. 87 to 93 % of animals in their cubicles) was followed in all variants by a more or less rapid departure from the cubicles from 4.30 am. Here, the animals in the free traffic system left the cubicles most quickly followed by the selective controlled ones and then the controlled traffic cows. At 5.30 and 6.00 am these differences were highly significant.

Between 8 am and around 4 pm a further resting phase was observed with this time only between 50 and 60% of the cows in their cubicles. Here, there were more free traffic cows to be seen in their cubicles compared with the other groups. Both controlled traffic systems began their night rest period at around 7 pm, the free traffic group at around 8 pm. This difference is very likely attributable to daylength influence because the

Table 1: Previous results of this investigation

Criterion	Traffic form		
	free	controlled	selective controlled
Milkings/ cow and day	2.3	2.6	2.6
Additional visits/ cow and day	0.6	1.4	0.7
Cows collected/day	15.2	3.8	4.3
Intermilking period > 16h	12.7 %	2.9 %	2.6 %
Feed intake [Dm/cow and day]	16.9	16.1	17.4
Feeding periods/ cow and day	8.9	6.6	7.4

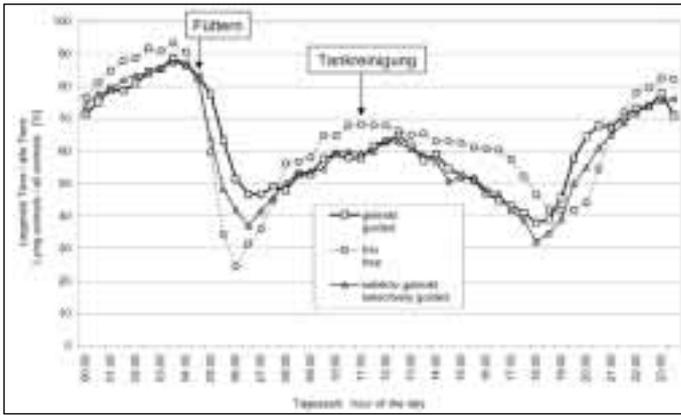


Fig. 1: Number of cows in the lying area during the day

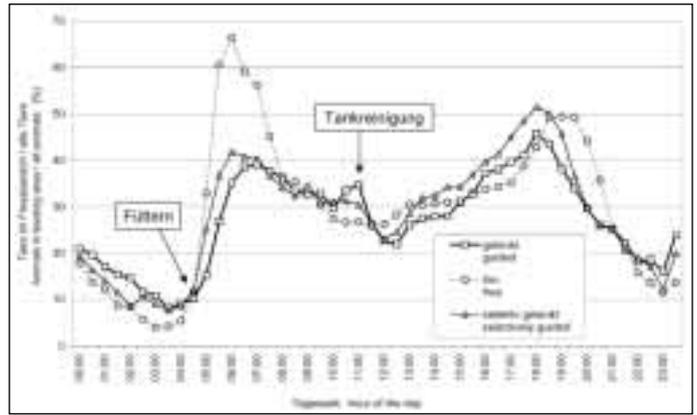


Fig. 2: Number of cows in the feeding area during the day

free traffic trial took place in July, the controlled and selective controlled traffic in September and April respectively.

In total the free traffic system showed the most strongly characterised daily rhythm within the herd, followed by selective controlled and then controlled.

Feeding behaviour

As with the lying behaviour the greatest difference in feeding behaviour was apparent in the mornings (fig. 2). The proportion of cows in the free traffic group within the feeding area rose most rapidly, followed at a considerable distance by the selective control and control traffic groups. Here it was clear that the capacity of the automatic milking machine apparently allowed no faster access to the feeding area. This was also backed up by the fact that in the morning 66% of the free traffic cows stayed in the feeding area compared with around 40% for both controlled traffic variants. In the remainder of the day it was shown that all three traffic systems gave a similar picture characterised by a rest period around midday and an increase to around 50% occupancy between 5 and 8 pm. Notable with both controlled traffic forms was the decrease in the number of cows in the feeding area during tank cleaning. This was apparently due to the blocked access to the milking box at that time. In total it was shown that free traffic system once again reflected the strongest daily rhythm followed by the selective control cows and the control ones.

Waiting cows at the milking box

Regarding the number of waiting cows at the milking box, great differences were demonstrated between the free traffic cows and those from both other treatments. As figure 3 demonstrates the controlled traffic group members often created queues at the milking box whereas with the free traffic cows as a

rule only a few cows had to wait at the entrance. On average 1.3 cows had to wait in the free traffic herd whereas this figure more than doubled with the other variants with 3.2 and 3.3 cows in the queue.

The distribution of the waiting cows over the day showed the same pattern with all three traffic forms. Although the queue at the milking box was definitely shorter over the day with the free traffic cows. In all the trials the mornings and evenings saw the most cows waiting at the milking box.

During tank cleaning (from 11 am to 12 noon) the number of cows waiting at the box decreased. They seemed to sense that there was no access at that time.

During the night only a few animals waited at the box with all the trials.

Hereby it can be noted, however, that the queue lengths at the milking box did not necessarily allow conclusions how long individual animals had to wait each day in order to get into the feeding area.

Discussion

Thune et al. [5] compared the free, controlled and selectively controlled traffic systems – again with a single box milker – but, however, with substantially higher performance cows and shorter adjustment periods. Their experience matched in total the results given here and also confir-

med the effect of the cow traffic system on the number of waiting animals.

Hogeveen et al. [3], too, found, in investigations with 53 cows and a two-box plant, that substantially more animals from the controlled traffic system were waiting at the milking boxes compared with those from the free traffic system.

But against this [4] found a less emphatic daily rhythm on the two-box plant. A possible reason for this could have been the central positioning of the preselection point/milking system with at the same time a higher number of cows whereby it might have been possible that the feeding area was not able to be accessed quickly enough.

Summary

The effects of three different cow traffic systems on the behaviour of a dairy herd was investigated. Hereby the distribution of cows within three function areas was determined and classified, the areas being feeding, lying and waiting. In total, the herds in all three investigations showed a clearly characterised daily rhythm. Differently from the preceding investigations [1, 2], the selective controlled traffic system differed only slightly from the controlled traffic group under the herd behaviour aspects investigated here.

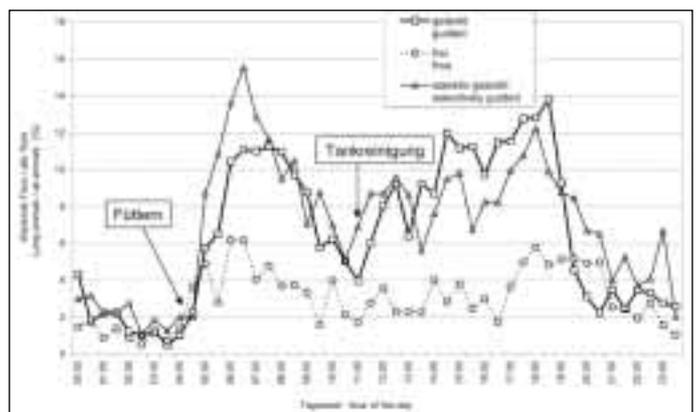


Fig. 3: Number of cows waiting in front of the milking box during the day