

## SOLUTIONS OF CONCENTRATED FEED CONSUMPTION BY COWS IN CONDITIONS OF ROBOTISED MILKING

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**Abstract.** The authors researched in the solutions of concentrated feed distribution for cows milked using the milking robot VMS made by *DeLaval*, Inc. The research was carried out on the milk farm “Līgotnes” of the Training and Research Farm of the Latvia University of Agriculture “Vecauce”. On this farm cows receive mixed feed in three different places: together with a basic feed mix eating it at the feed table, in a robotised milking stand and in the mixed feed feeding stations. In practice, however, the feed is fed mainly in two places omitting the concentrated feed stations. During the research it was established that the use of concentrated feed stations is required when keeping high productive cows with the milk yield exceeding 30 kg per day. Otherwise, they do not consume the amount of concentrated feed which is necessary to ensure the milk yield foreseen in the normative.

**Key words:** cow feeding, mixed feed, robotised milking, concentrated feed stations.

### Introduction

Concentrated feed is a vital food aid, which has high concentration of energy and good nutritive digestibility. In addition concentrated feed is used as improver of the taste quality of the basic-feed mixture in order to increase the eaten feed amount. Concentrated feed, however, must not be fed absolutely because it may cause diseases of the animal digestive tract and metabolic disturbance. This is why the milking cows should receive the amount of concentrated feed according to their milk yield, therefore 300-400 g per 1 kg of milk [1; 2].

Concentrated feed is accustomed to be fed in several places in cases when there is cow robotised milking used.

First of all, it is included in the composition of feed mix which is fed at the feed table. In compliance with our researches [3; 4] the advisable addition of concentrated feed is approx. 10 % of the amount of grassy fodder (mass). Such concentrated feed amount ensures well basic feed consumption, but does not cause fatness of less-productive cows.

Secondly, concentrated feed is fed in cow robotised milking stands. Dispensation of concentrated feed in these places promotes the cows to visit the milking stands voluntarily, because animals like the food very much. Therefore, concentrated feed feeding reduces employees' labour time which is mostly spent for chasing cows for milking.

Thirdly, in addition, there may be used the concentrated feed stations as well where there is dispensed the amount of concentrated feed which has not been consumed by cows in the two previous consumption places.

For all that, the concentrated feed stations are not cheap; this is why their use increases the total costs of technological machines and the milk prime-cost on the farm. This is the reason why these stations are rarely used nowadays; concentrated feed is fed only in two places: at the feed table where the feed is mixed with the basic feed mixture and in the robotised cow milking stand.

The aim of the research is to study the necessity of concentrated feed stations for feeding various productivity cows. The authors guided from the estimated mixed-feed consumption amount opportunities provided in a feed ration.

### Materials and methods

For the research the authors used the data from the milk farm “Līgotnes” of the Training and Research Farm of the Latvia University of Agriculture “Vecauce”, where there are used two robotised milking stands VMS made by *DeLaval*, Inc.

In the previous researches [3] the authors established the desideratum amount of concentrated feed which should be included in the basic feed mixture, as well as the amount of concentrated feed which is eaten together with the feed mixture by cows of different productivity.

The authors used the information saved in the herd management system regarding a period of two weeks in order to gain data about the consumed amount of concentrated feed during milking. By help of this information the authors established the remaining time of different productivity cows in the robotised milking stand, as well as the average amount of milking times per day. For this reason the cows were grouped according to their milk yield per day, therefore, separating the cows within the milk yield up to 15, 15-25, 25-35, 35-45 and more than 45 kg per day.

The maximal amount of concentrated feed allowed to be consumed by each cow of a separate productivity group was calculated according to the formula

$$M_{s,i} = M_{m,i} + v_s \cdot n_{s,i} \cdot t_{s,i}, \quad (1)$$

where  $M_{s,i}$  – maximal concentrated feed amount which may be consumed by one cow of contingent productivity group,  $\text{kg} \cdot \text{day}^{-1}$ ;

$M_{m,i}$  – amount of concentrated feed eaten together with the feed mixture by a cow of contingent group,  $\text{kg} \cdot \text{day}^{-1}$ ;

$v_s$  – average concentrated feed consumption speed,  $\text{kg}/\text{min}$ . The authors followed the literature data [5], the average concentrated feed consumption speed per cow is  $0.33 \text{ kg} \cdot \text{min}^{-1}$ .

$n_{s,i}$  – average amount of milking times for cows of contingent groups, times per day;

$t_{s,i}$  – average duration of one milking time for cows of contingent group, per minute.

For the cows of the corresponding milk yield group that were able to consume the necessary amount of concentrated feed per day the successive inequality should be in force

$$M_{s,i} \geq M_o, \quad (2)$$

where  $M_o$  – normative amount of concentrated feed per one cow of contingent yield group,  $\text{kg} \cdot \text{day}^{-1}$ .

## Results and discussion

For the information which is gained due to the processing of the data saved in the system of cow herd management, see Fig.1, Fig.2.

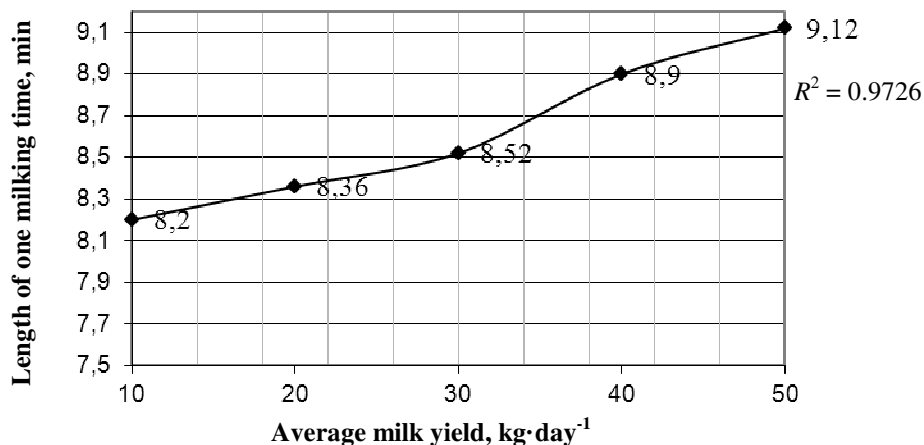


Fig. 1. Average length of one milking time for cows with different milk yields

In the figure we can see that the cows remain in the milking stand between 8.2 and 9.12 minutes, it depends on their milk yield. If a cow has higher yield, then its milking time is longer as well. In addition, more productive cows visit the milking stand more often. If, for example, the average milk yield is only  $10 \text{ kg} \cdot \text{day}^{-1}$  then these cows are milked 1.6 times per day, but the cows the average milk yield of which is  $50 \text{ kg} \cdot \text{day}^{-1}$  visit the milking stand 3.63 times per day.

For the information about the necessary amount of concentrated feed for cows according to their milk yield and actually available amount of concentrated feed which they may consume together with the feed mixture and while remaining in the milking stand see Fig. 3.

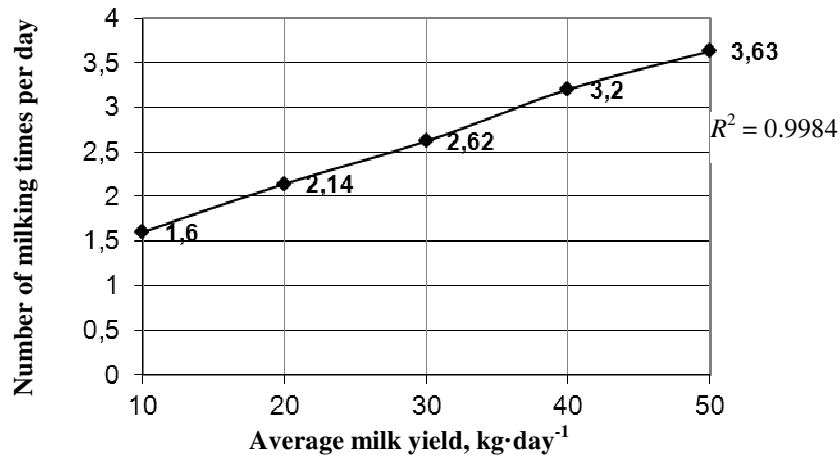


Fig. 2. Average amount of milking times per day for cows with different milk yields

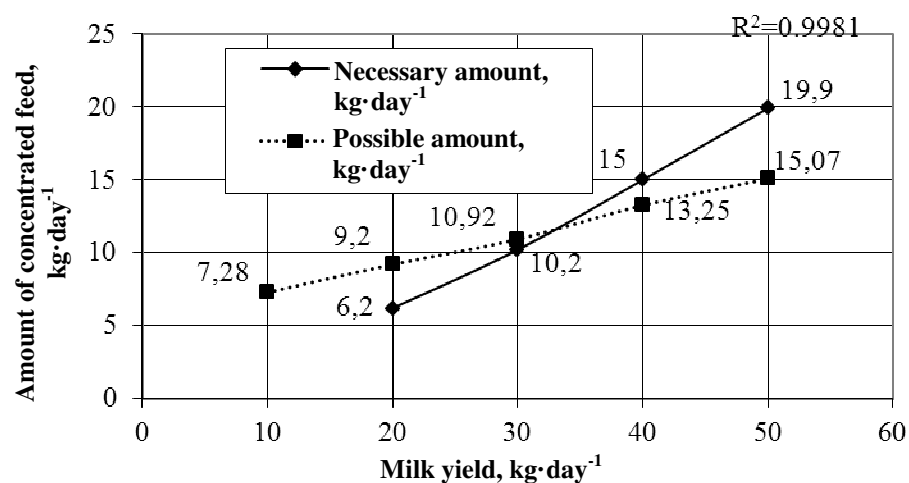


Fig. 3. Necessary amount and actually consumed amount of concentrated feed for various productivity cows if concentrated feed is included into the feed mixture (~10% according to its mass) and is fed in the milking stands, but is not used in the concentrated feed stations

From the figure the authors conclude that the cows which have higher milk yield consume more concentrated feed. The reason is that these cows remain in the milking stand for a longer period and visit it also more often. Besides, they consume more feed with added concentrated feed as well. However, such increase of the concentrated feed amount is insufficient for highly productive cows which milk yield exceeds 30 kg per day (7000-8000 kg·year<sup>-1</sup>) because they need 15 and more kg of concentrated feed per day. This is the reason why it is useful to use the concentrated feed feeding stations for feeding such cows, because there they can receive the amount of concentrated feed these cows are short of.

There is another solution for this issue as well – to increase the amount of concentrated feed that is added to the feed mixture. Then, however, obesity of less productive cows is possible. Therefore, in such case all cows which are milked with the robotised milking machines should be grouped according to the milk yield level, excluding milk yield difference that is higher than 20kg per day for one group cows.

## Conclusions

1. If cows are milked with the robotised milking machines VMS made by DeLaval, Inc. then the length of one milking time and the number of milking stand visits per day depend on the milk yield. For cows with the average milk yield 10kg per day the milking length is 8.2 minutes, but for cows with the average milk yield of 50kg per day it takes 9.12 minutes. Besides, the number

of milking stand visits for respective productivity cows is 1.6 and 3.6 times per day. This is why more productive cows may consume more concentrated feed while are milked; calculation is done considering one day.

2. More productive cows also consume more feed mixture which contains concentrated feed and therefore with the mediation of it cows may receive more concentrated feed in total.
3. If the average milk yield does not exceed 30 kg/day then the cows may receive the necessary amount of concentrated feed with the basic feed mixture, as well as while they are milked. But in cases when the milk yield is higher than 30 kg/day such concentrated feed amount is insufficient and extra cow feeding is advisable by using the concentrated feed feeding stations.

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### **References**

1. Brade E., Brade W. Wieviel Korn braucht die Milch? Neue Landwirtschaft, 2008, Nr.5, pp. 58-59. (In German).
2. Nydegger F., Bolli S. Strukturproblematik bei Mischrationen für Hochleistungsherden. Ergebnisse einer Erhebung auf Milchviehbetrieben. In: ART-Berichte, Tänikon, 2009, Nr.719. S.8. (In German).
3. Latvietis J., Priekulis J. Consumption of concentrated feed for milk cows in conditions of robotized technology. Proceedings of the 10th International Scientific Conference “Engineering for rural development”. Proceedings, Volume 10. Jelgava, May 26-27, 2011, pp. 55-58.
4. Latvietis J., Priekulis J., Eihvalde I. Problems of cow feeding in robotic milking and loose handling conditions. Proceedings of the 7th International Scientific Conference Engineering for Rural development. Jelgava. 2008. pp. 270-274.
5. Osītis U. Dzīvnieku ēdināšana kompleksā skatījumā. LLU. Jelgava. 2005. 320 lpp. (in Latvian).