Das Wochenblatt für Landwirtschaft, Dorf und Familie

BAUERN ZEITUNG

Off print

No. 20/2020 • Page 36 to 37
Volume 61

FEED MANAGEMENT

Feed, don't heat

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dbv net work

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dbv network GmbH
Wilhelmsaue 37, 10713 Berlin

www.bauernverlag.de

Feed, don't heat

***During heat,** dairy cows start selecting roughage.*

FOTO: SABINE RÜBENSAAT

Cows are distributed across the globe: even in the Arabian desert or high up in the cool North of Scandinavia. Heat and cold do not seem to bother them much. However, cattle also regulate their body temperatures, for example, through feed intake. This must be considered in **ration formulations** in the summer.

Cows are most comfortable in a temperature range of between –15 and 15 °C. Cows find it more and more difficult to release excess heat through the skin during lengthy, persistent warm periods with temperatures of over 25 °C. This heat then increasingly has to be released through evaporation by sweating and breathing. The problem is the following: feed conversion is naturally inefficient in ruminants and the metabolic processes in the compartments of the forestomach produce lots of heat, especially with increasing fibre content in the feed.

Creating optimum conditions through husbandry practices

In addition to temperature, the most significant parameters are humidity, sunlight and wind, whereby temperature and humidity are most important in cattle sheds. Of relevance here is that critical temperatures are not constant, but may change depending on the situation. For example, there are differences in the animals' sensitivity, depending on productivity, genetics and age. When considering heat stress, in particular, the fact that different thresholds apply for heat stress in different climate zones must be taken into account. For example, US publications have described temperature-humidity indices of over 72 (25 °C at 55 % relative humidity) as constituting moderate heat stress. However, more recent studies carried out in Germany demonstrate that heat stress already sets in at temperature-humidity indices of 60 (16 °C at 55 % relative humidity) and a reduction in feed intake and milk production is to be expected. Data from international publications are therefore not always automatically applicable and the climatic conditions alone are insufficient to make any statements on heat stress. The animal's reaction must always be taken into consideration. The following signs may be attributed to heat stress:

- reduction in movement and fewer visits to the feed trough,
- reduced feed intake (4–6 kg DM)
- deterioration in the consistency of the dung (also due to reduced fibre intake)
- significant increase in water intake (+ 5 l/kg DM feed at > 25 °C or + 3–5 l / °C)
- reduction in milk production (minus 3–4 kg) and milk constituents (approx. minus 0.5 pp),
- standing more common (standing : lying = 2 : 1)
- increase in body temperature (rectal > 39 °C),
- increased breathing through the mouth and elevated breathing rate (from 30 to 80/min),
- significant reduction in intensity of oestrus behaviour (frequently only in the evenings and potentially acyclic until autumn),
- increase in calving problems (more stillbirths, lower birth weights, more frequent early pregnancy losses),
- poorer colostrum quality,
- weakening of the immune system,
- increase in the milk cell count.

Reduce high-structure feed

Digestion of fibrous feed releases more heat than the digestion of concentrated feed. This means that the animals reduce the intake of roughage (if they have the opportunity to do so). Overall feed intake is curbed if no selection is possible. High-structure feed should therefore be restricted in TMR mixtures. The feed is then more like a mast ration than the usual milk ration. Only the best quality roughage that is low in fibre content should be used, particularly in the summer.

The feed must consist mainly of roughage that causes a heat loss that is no greater than 40 %. This can be roughly calculated through the difference between metabolisable energy (MJ ME) and net energy lactation (MJ NEL). High fibre hay or straw should be omitted, insofar as is possible.

Feeding the lower limit of 350–400 g of structure-effective crude fibre per 100 kg body mass must be aimed at and, if necessary, be supplemented with rumen buffer substances. High-pectin feeds, such as turnips and products derived from them can be used to support structural effectiveness.

Metabolic acidosis is often also common in cases of heat stress. On the one hand, the reasons for this are the depression in high-structure intake and erroneous counteracting of this with concentrated feed when there is a drop in milk production and, on the other, the increased loss of buffer substances, such as sodium bicarbonate, in sweat and urine. Furthermore, attention must be paid to the fact that the risk of acidosis is still present after a hot period has passed. Feed intake often increases dramatically when temperatures are dropping, resulting in a concomitant increase in the production of acid in the compartments of the forestomach.

In this case, a transitional feed is recommended to aid adaptation to the changes in metabolic activity in the rumen. The quantity of concentrated feed, in particular, must be reduced in a targeted fashion for transponder and/or milking parlour feeding as the intake of fibrous feed drops off and that of concentrated feed usually does not. Feed selection must therefore be minimised when using TMR feeding. Every bite must contain sufficient structure-effective fibre, while considering the basic quality of the feed. The TMR can by all means be mashed slightly more (compact TMR) and the water content in the ration increased (up to 40 % of DM)

Increase feed into the intestines

Knowledge on the effects of individual feeds has become the be-all and end-all in dairy cow feeding. During periods of heat, in contrast to other demands, the approach should err on the side of not challenging the rumen.

This means that the proportion of nutrients passing unaltered through the rumen (rumen-protected fats (300–500 g/ animal/day), protected protein concentrates, grain maize instead of cereal starch (up to 1.2 kg resistant starch per animal and day)) should be increased to limit the heat-generating microbial activity in the compartments of the forestomach. The use of protein feeds with a high proportion of rumen-protected protein also takes pressure off the liver as less ammonia passes through it.

Fats have the highest energy density of all nutrients – 1 kg supplies an average 19–26 MJ NEL – and are therefore of particular interest to the energetic enhancement of feed rations for high-productivity cows. In addition, the use of rumen-protected fats not only reduces fermentation heat. Metabolic heat losses are also significantly lower for fat than for carbohydrates. Rumen-protected fats should be used, as unprotected fats cause fermentation disorders in the compartments of the forestomach above approx. 800 g per cow and day. Total fat intake can be increased to 1,600 g (of which 50 % are rumen-protected) when rumen-protected fats are fed. However, a hard-nosed approach that results in this limit being exceeded in the summer feed should be avoided. Feed intake must be closely monitored as the regulation of feed intake in dairy cattle is subject to strong lipostatic control. In other words, the blood concentrations of free fatty acids play an important role in limiting feed intake and an overdose of fat may have a counterproductive effect. In practice, the addition of 1.5–2 % rumen-protected fats to dry matter or feeding 300–500 g per animal and day has proven safe.

With regard to conditioning the animals, the fact that the overwhelming proportion of fatty acids in the blood stems from metabolic processes in the rumen must be considered, while over-conditioned cows and cows that mobilise their body fat reserves due to limited feed intake always have a higher blood fat concentration and therefore eat less. This shows how important it is to, firstly, take all measures necessary to ensure adequate feed intake and, secondly, to send the cows into the summer in optimum condition. In addition to taking pressure off the rumen, (feed) management must also be adapted to the heat stress situation.

Rations with a diverse composition are often fed on better than monodiets. Above all, the different breakdown rates for nutrients in the compartments of the forestomach are responsible for this, in addition to the superimposition of sensory deficits. The total ration should not contain more than 50 % DM.

Water can essentially be added to the feed mixture. However, the fact that this is "empty" water must be taken into consideration, which cannot be equated to the cell sap in the plant-based feed. In particular, the low quantities of acid in dry silage are insufficient to maintain the pH within the acidic range. There is a decline in feed intake and the aerobic stability of the feed mixture. Silage or feed mixtures that have been reheated must essentially be avoided as feeding on them is poor and they place further pressure on thermoregulation in the cow.

Furthermore, high mixing and distribution accuracy must be ensured during preparation of the TMR as the animals become selective in order to reduce the intake of roughage.

Important points for feed presentation: Dairy cows eat up to two thirds of feed in the night during summer months. The food troughs must therefore never be empty, particularly in the evenings and at night. Provision of fresh silage or TMR from the silo, without interim storage, removal of feed residues and the cleaning of troughs should therefore be carried out in the evenings. Not least, this makes sense as the aerobic changes in the food trough are significantly greater during the day than at night.

More frequent provision of feed is generally necessary during the summer months. More feed should be provided in the evenings than in the mornings. Feed should never be put into interim storage. In addition, feed should be pushed in the direction of the cows more frequently (if possible, also at night) to encourage them to eat. Finally, correct silo management is important so feed provision is adjusted to the silo. While 1.5m/week is sufficient during the winter, 2.5m/week should be aimed at in the summer. Furthermore, if possible, the north sides of the silos should be opened, especially during the summer months.

Balancing the loss of minerals

Last but not least, water and minerals also form part of the feed. Water loss due to sweating amounts to 1.5 l per hour, even at temperatures of around 25 °C. This inevitably also results in an increase in the loss of minerals. A mineral feed with higher contents of vitamin E and selenium should be used as an addition to account for the increased requirements for antioxidants to avoid oxidative stress.

The sodium requirements, increased by around 15 %, can be covered with cattle salt. The provision of additional water troughs is recommended, or the available drinking area should be enlarged, due to the increased water requirements (5 l/kg DM) and the troughs should be checked and cleaned more frequently.

CONCLUSIONS: The interplay between optimised husbandry practices, optimisation of rations and feed provision is important, in addition to the supply of water and minerals, to make life more pleasant in the summer for highly productive dairy cows. The limits of ruminant feeding must be entered into to a greater extent and intestinal feeding focussed on more than usual. Ration optimisation is not only more challenging, but also more successful, due to the provision of more stable fats, resistant starch and protein and easily processed mineral supplements. The dairy cows should be accustomed to the feed in parallel with the increasing temperatures and the feeding success should be monitored continuously during phases of marginal supplies.

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