

Foto: Landpixel

DIGESTIBILITY in Focus

Dr. Christian Böttger and Ralf Kortwinkel from the North Rhine-Westphalia Chamber of Agriculture take a closer look at the digestibility and explain which parameters are important in terms of ruminant feeding and ration planning and how these can be incorporated into practice.

Agricultural businesses invest considerable effort in the production of high-quality roughage in the form of grass or maize silage. In order to assess the results of this effort and make optimal use of the products in feeding, it is essential to know the quality of the feed. It is therefore always advisable to have the silage tested in a laboratory to determine its feed value. The resulting test report provides information on nutrient content, silage quality and energy content, which was previously specified as net energy for lactation (NEL) for dairy cows or metabolisable energy (ME) for beef cattle and heifers. In future, this value will be reported as ME for all ruminants. Both values describe how much energy the animal can extract from the feed.

From digestibility to energy value

The feed cannot be fully utilised by the animal; a variable proportion of the nutrients and energy it contains always ends up undigested in the faeces. Digestibility refers to the percentage of nutrients or energy ingested that is not excreted with the faeces.

Digestibility is particularly important in the evaluation of animal feed and is closely linked to the ME and NEL content. In fact, the proportion of unused energy in the faeces is usually significantly greater than the energy losses via methane production in the rumen or even excreted in the animals' urine. To determine the digestibility of practical samples, it is possible to use parameters that are collected in vitro, i.e. in the laboratory.

From test tube to ration

Energy assessment will change as a result of the implementation of the new nutritional recommendations (GfE 2023) for dairy cows. In-vitro methods remain of great importance for the routine assessment of practical samples in feed laboratories.

Relevant parameters for digestibility include the so-called enzyme-soluble organic substance (ELOS) or gas formation in the Hohenheim feed value test (HFT). Both

methods use feed samples of grass or maize silage to simulate the digestive processes that take place in animals „in a test tube“ by incubating them with the appropriate enzymes or using rumen fluid containing the typical microorganisms. Taking these variables into account, estimation equations are used to determine the digestibility of the organic mass and energy content. It is important to work on a feed-specific basis: different equations are applied for grass and maize products:

Maize: Whole plant silage from maize is an essential component of many rations on dairy or fattening farms. The starch from the cobs provides easily available energy that can be broken down well.

The remaining plant parts, consisting of stems, leaves and cobs, provide feed structure due to their high plant fibre content, but also contribute to energy supply. Since fibre in the form of NDF (neutral detergent fibre) often makes up a large part of the ration, its digestibility is crucial for overall digestibility. The digestibility of NDF (NDFD) determined in the laboratory allows for a more accurate assessment.

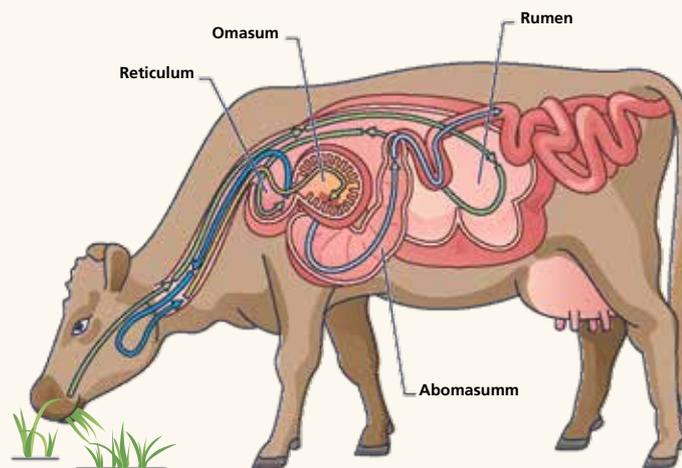


Fig. 1 Several factors influence digestibility in ruminant feeding. Digestibility refers to the percentage of nutrients or energy ingested that is not excreted in the faeces.



Quelle: R. Korrwinkel



DIGESTIBILITY AS A KEY FACTOR FOR BETTER FORAGE PERFORMANCE

Recommendation by Deutsche Saatveredelung AG:

The Milk Index varieties from Deutsche Saatveredelung AG (DSV) for grass, maize, sorghum and legumes stand out due to their high digestibility. This results in faster rumen passage, which directly increases feed intake. This improves the cow's energy and nutrient supply – a clear advantage for milk yield.

Grass: NDFD is also a relevant parameter for grass silage. As with maize, fibre provides structure and is essential for a ruminant-friendly ration. Fibre content and digestibility significantly determine the energy content. As the plant matures physiologically, the fibre content and lignin content increase, which reduces the digestibility of grasses. Sugar content, influenced by sunlight, temperature and breeding, increases the energy density, as sugar is highly digestible. Grass is also an important source of protein, although the crude protein content decreases with maturity. Therefore, this should be considered during harvesting and subsequent ration planning.

Improving digestibility in practice

When producing grass silage, it is important to monitor the decreasing digestibility of the plant as it matures. In maize cultivation, the balance between starch content, residual plant digestibility and total yield plays a role.

Residual plant digestibility: If you have a deeper look at the laboratory analysis report, it is important to consider the individual parameters. Looking at the reported energy content (previously NEL, in future ME) of grass or maize silage allows a good assessment of its suitability in the ration. The ELOS value can be a helpful indicator of the digestibility of the residual plant in maize silage, for example. It can be assumed that the starch from the maize is completely degraded using the ELOS method. For silages with the same ELOS content, the following applies: the higher the starch content of a silage, the lower the estimated digestibility of the residual plant. If silage 1 contains more starch than silage 2, identical ELOS values indicate a lower residual plant digestibility in silage 1.

Starch digestibility: Starch digestibility, on the other hand, is not only determined chemically; mechanical grain processing also plays an important role. An initial visual assessment can be made by an experienced observer at the silo. Grain processing is more clearly visible in the bucket test described in Fig. 2. Quantitative values can be provided by the kernel processing score (KPS) or corn silage processing score (CSPS) determined



Fig. 2: The bucket test shows the degree of preparation of the grains. Here, the silage is mixed with water. After a short waiting period, the light material floating on top is skimmed off and the water is poured out. What remains are the heavy materials, such as maize grains.

Source: R. Kortwinkel

in the laboratory. This is a parameter that evaluates the quality of grain fragmentation in maize silage. A high CSPS value indicates better processing of the maize grains, which can lead to improved starch digestibility in cows.

Finally, good silo management is essential for both grass and maize silage in order to maintain the nutritional value of the harvested feed right up to the trough. Reheating in particular can cause considerable energy losses, which effectively reduce the analysed content. Such reheating can occur as a result of unclean cutting, as shown in Fig. 3.

Grass and maize silages are part of rations. The ration formulation creates optimal conditions in the rumen so that the full potential of fibre degradation and digestibility of the ration components can be exploited.

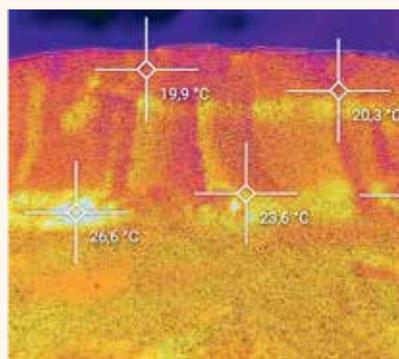


Fig. 3: Loose feed at the cut surface: reheating costs energy.

Source: R. Kortwinkel

Conclusion

Those who know the quality of their silage can make targeted use of its potential in the ration. Digestibility – especially of the fibre content – is crucial for the energy content of the feed. Modern laboratory analyses provide reliable information on feed quality. In addition to variety selection and site conditions, the harvest time is a key factor in optimising digestibility. Mechanical processing, for example in maize kernels, and clean silo management are also crucial in order to avoid nutrient losses. Only by taking all of these factors into account, rations can be formulated in an economical and ruminant-appropriate manner.

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