Differences of energy density from plant species found in permanent grassland using the Cellulase Method in comparison to the Crude Nutrient Method

R. Bockholt, K. Friedel and F. Buske
The Faculty for Agricultural and Environmental Science at the Rostock University, Federal Republic of Germany, 18051 Rostock, Email: Renate.bockholt@uni-rostock.de

Keywords: forage value test, energy density, Cellulase Method, grasses, herbs, permanent grassland

Introduction If no special instructions have been given, the metabolic energy (MJ/kg DM) and the energy density (MJ NEL/kg DM) of grass samples are calculated by the agricultural test institute using a standard valuation formula as regards crude nutrients, crude fiber content, crude protein contents and crude ash. On the other hand, it is well known from feeding tests that permanent grassland grasses and herbs, which may be dominant under semi-intensive or extensive management, can have low digestibility and low energy density.

Material and methods A calculation of the difference has been made using 1500 data sets of 43 plant species from the peat soil grassland (1st - 11th week after 1st May). These data sets were tested by the laboratory of the institute using the Weender Forage Analyses for crude fiber content, crude protein content and crude ash content, in addition were tested using the Cellulase Method (Friedel, 1990) for digestibility. The energy density were calculated using 2 different methods and afterwards were calculated the differences of all the plants, samples and dates.

Results The energy density varies if all results between 8 and 2 MJ lactation per kg dry matter are taken into consideration. On average, the value valid for 43 plants will be below the limit of 6 MJ NEL, which applies to high-yield cows, between the 4th and 5th week after 1st May. It is noteworthy that both the positive and negative limits have been detected on herbs. The autochthonous plant species, on average, get a better assessment by 0,55 MJ NEL/ kg DM than they should have got when being tested with the unified crude nutrient formula, which applies for high-quality grassland grasses. The differences vary from species to species and increase with all species during the vegetation period. In some extreme cases individual plants investigated by means of the crude nutrient formula, have been given assessments that proved out to be by far too good by 2 MJ NEL.

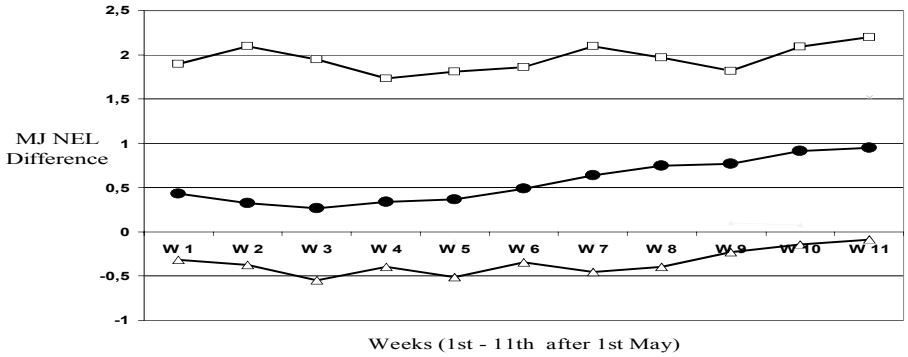

Figure 1 Differences of energy density in dependence on plant species and time in comparison of 2 methods, average (43 plant species), maximum = *Filipendula ulmaria*, minimum = *Glyceria maxima)*

Conclusions The crude nutrient method may lead to erroneous calculations of cow rations. By the additional inclusion of a digestibility examination, which can be done with the enzyme Cellulase or directly with the rumen fluid (Hohenheim forage value test), the special energetic forage value of autochthonous plants found in extensively managed permanent grassland can be investigated more precisely. Additional examinations of plant samples taken at the best cut-off date at the end of May demonstrated that the Hohenheim forage value test and the Cellulase Method coincided well provided that there was no infestation with fungi or putrefaction on dead leaves. However, it is known from examinations on forage that, in the opposite case when foliar fungi and putrefactive agents are found on necrotic cells, there are even considerable differences between the results obtained by the enzymatic Cellulase Method or the Hohenheim forage value test. Whilst the enzyme Cellulase is not capable of reacting to fungal toxins, the rumen fluid with its living micro organisms is sensitive to quality losses due to fungal toxins or substances produced by putrefaction.

References

Friedel, K. (1990). Die Schätzung des energetischen Futterwertes von Grobfutter mit Hilfe einer Cellulase - Methode. Wiss. Z. Uni Rostock, Nat. Reihe, 78 bis 86