ADF_{om} and Crude Fibre Analytics: Comparison of the Glass Filter Crucible Technique with Automated FibreBag Technology (C. Gerhardt)

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1. Introduction

For the determination of crude fibres, ADF_{om}, ADL and $_{a}NDF_{om}$, glass filter crucibles are often used for filtration purposes after prior treatment with detergents. This type of filtration is comparatively time-consuming, with lots of potential sources for errors. For example, leaks can arise and, with frequent use, glass filter crucibles can bring about changes in porosity characteristics. In addition, substances which are released by samples during cooking may enter the pores of a glass filter crucible, leading to a drawn-out filtration process. C. Gerhardt GmbH has developed an automated system (Fibretherm FT 12) for the analysis of the aforementioned fibre fractions, in which filtration is performed using textile filter bags (FibreBags). In this system, the cooking, rinsing and filtration procedures are carried out automatically on up to 12 samples, for the analysis of crude fibres, ADF_{om} and $_{a}NDF_{om.}$ A requirement for the use of Fibretherm FT 12 is the equivalence of values between this method and the glass filter crucible filtration method (European Commission, 2009; VDLUFA, 2012a; VDLUFA, 2012b). After extensive testing by C. Gerhardt GmbH, the Landwirtschaftliche Untersuchungs- und Forschungsanstalt (LUFA, Agricultural Testing and Research Institute) in Speyer, Germany, inspected the comparability of the results of crude fibre and ADF_{om} analyses in a set of comprehensive tests. The results are presented in this article.

2. Materials and methods

The ADF_{om} and crude fibre analyses were performed comparatively, both in accordance with official VDLUFA methods, and using the Fibretherm FT 12, produced by C. Gerhardt GmbH. The Fibretherm FT12 features a movable carousel, in which samples are arranged in two rings, one inside the other. Once the test samples have been placed into the carousel, the latter is then placed into a boiling vessel, in which the cooking, rinsing and filtration processes occur. As part of the cooking and rinsing processes in the FT12, the detergent solution is pumped from the boiling vessel and channelled sideways, from above, into both test sample rings via two nozzles (Fig. 1). This allows the detergent solution to enter the FibreBags, which are open at the top, and to come into contact with the samples. At the same time, as part of this pumping process, the carousel rotates in the detergent solution in the boiling vessel. These measures provide for good wetting of the samples by the detergent solution and prevent the pores from becoming clogged. The comparative tests were performed by LUFA in Speyer. With both methodological approaches, twin determination processes (as a minimum requirement) were carried out on mixed feed for cattle, swine and poultry. Example settings for the program parameters have been put forth by Fettweis and Kühl (2010).

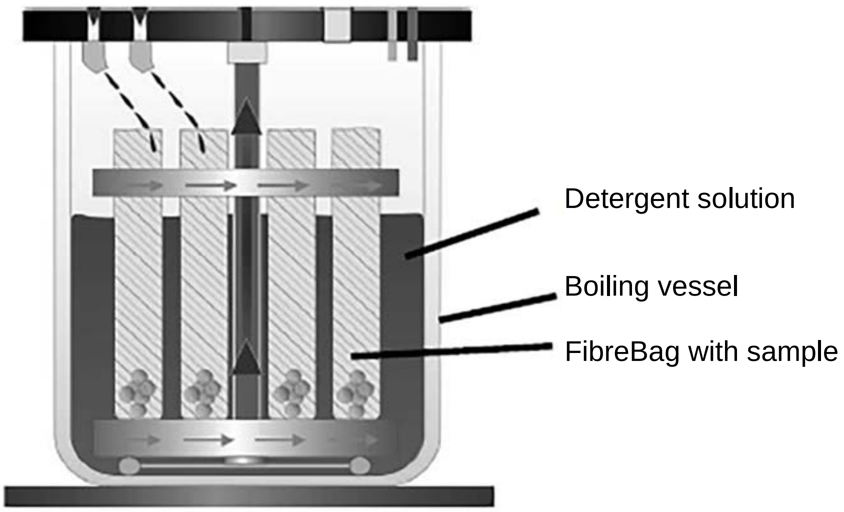

Fig. 1: Schematic representation of a boiling vessel with detergent solution, FibreBags and samples; during the cooking and rinsing processes, the detergent solutions are pumped centrally from the boiling vessel and then sideways from above into the open FibreBags

3. Results and considerations

In the tested cattle feed, ADF_{om} content was measured at between 6.4 % and 23.4 % and crude fibre content was between 4.4 % and 13.4 % (Fig. 2 and Fig. 3). Crude fibre content in the analysed pig and poultry feed was between 0.63% and 15.6 % (Fig. 4).

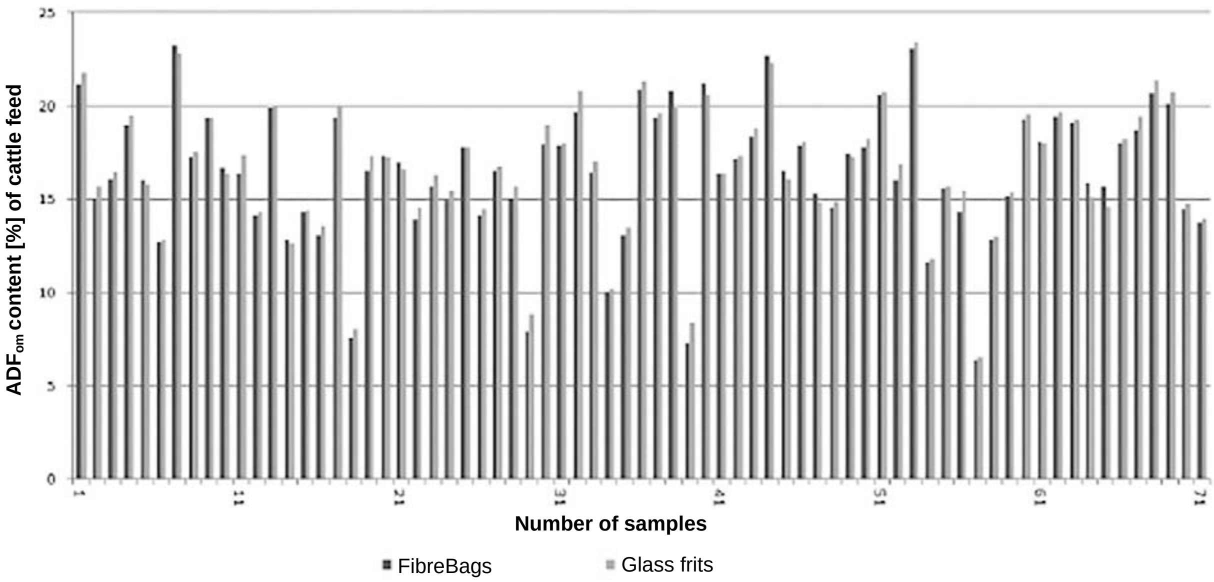

Fig. 2 ADF$_{om}$ content of cattle feed (shown here: average values from twin determinations)

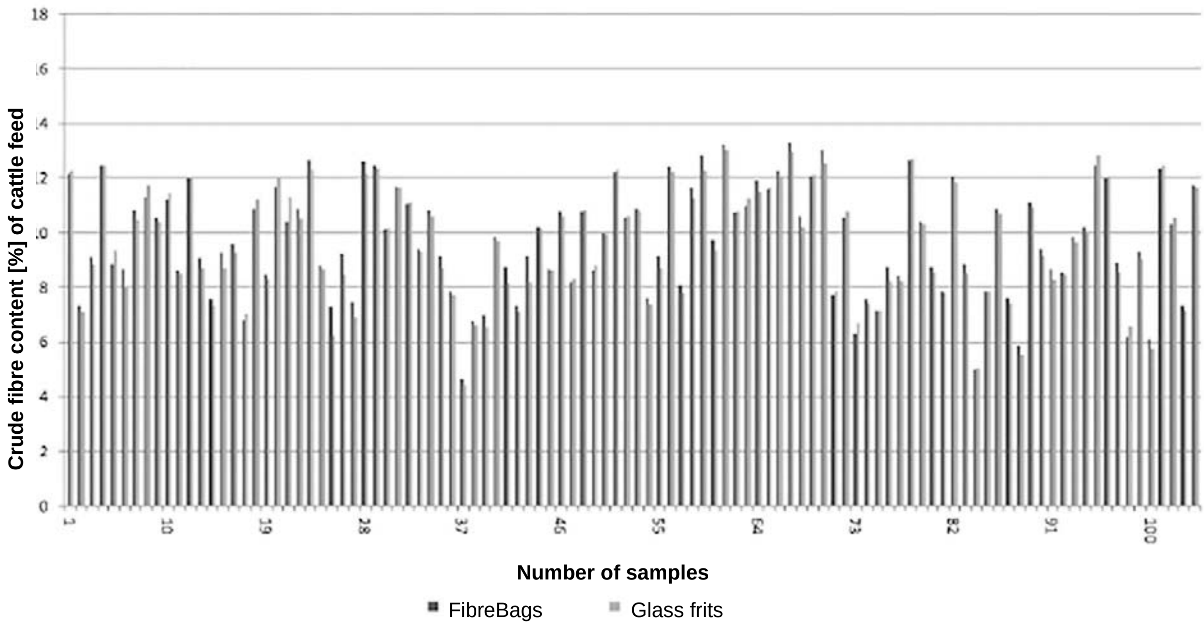

Fig. 3 Crude fibre content of cattle feed (shown here: average values from twin determinations)

In a comparison of the two methodological variants, the results show that all tested feedingstuffs demonstrate a high level of concordance for ADF$_{om}$ values and for crude fibre values (Fig.5).

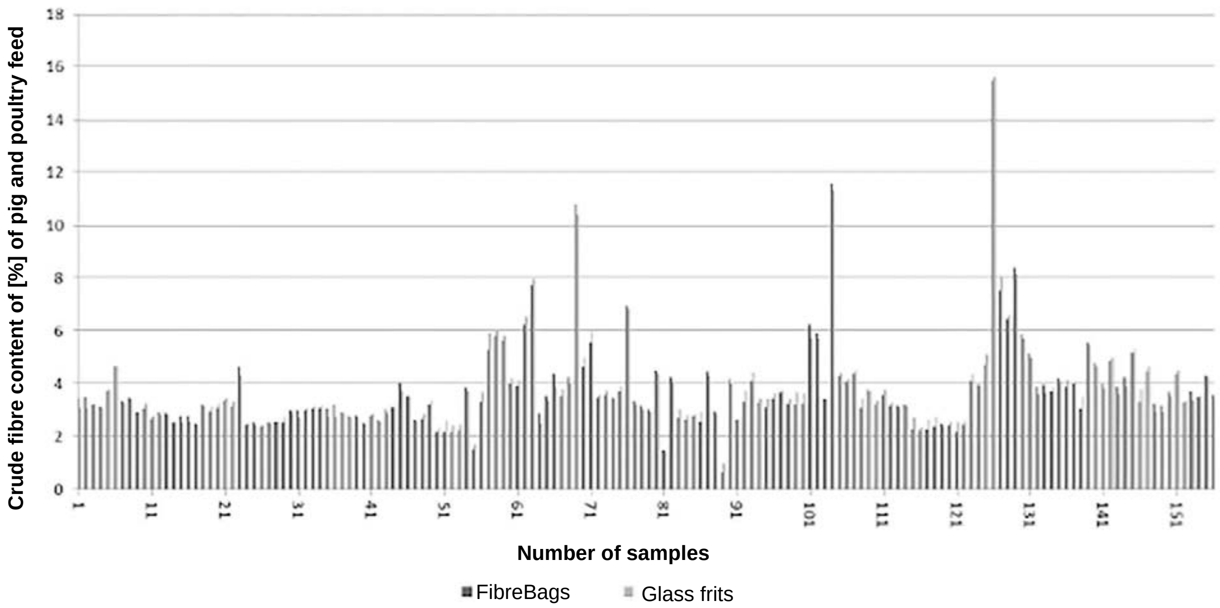

Fig. 4 Crude fibre content of pig and poultry feed (shown here: average values from twin determinations)

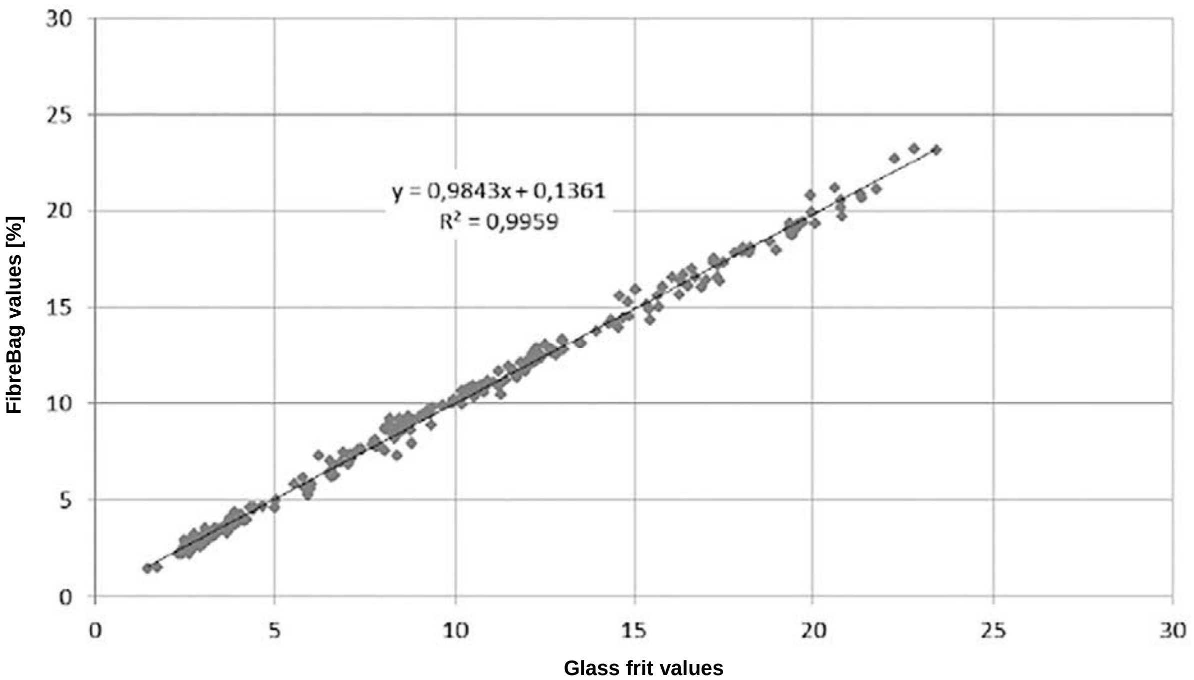

Fig. 5: Values from ADF_{om} and crude fibre analyses of all feed types with calculated function lines and coefficient of determination (R^2).

In cattle feed, the calculated correlation coefficients amount to 0.991 for ADF_{om} values and 0.990 for crude fibre values. For swine and poultry feed, a correlation coefficient of 0.989 was calculated for the two methods. The correlation coefficient for all tested feedingstuffs stood at 0.998. We can establish from these results that for mixed feed for pigs, poultry and cattle, correlative crude fibre and ADF_{om} values can be determined on the basis of these two methods.

4. References

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