

ADF Determination in Feed

Acid Detergent Fiber (Van Soest method)

Reference: **ISO 13906:2008**, Animal feeding stuffs – Determination of Acid Detergent Fiber (ADF)

AOAC 973.18 Fiber (Acid Detergent) in Animal Feed

Tested with **VELP Scientifica FIWE Advance Fiber AutoExtractor** (Code F30500500) and **COEX Cold Extractor** (Code F30520204)



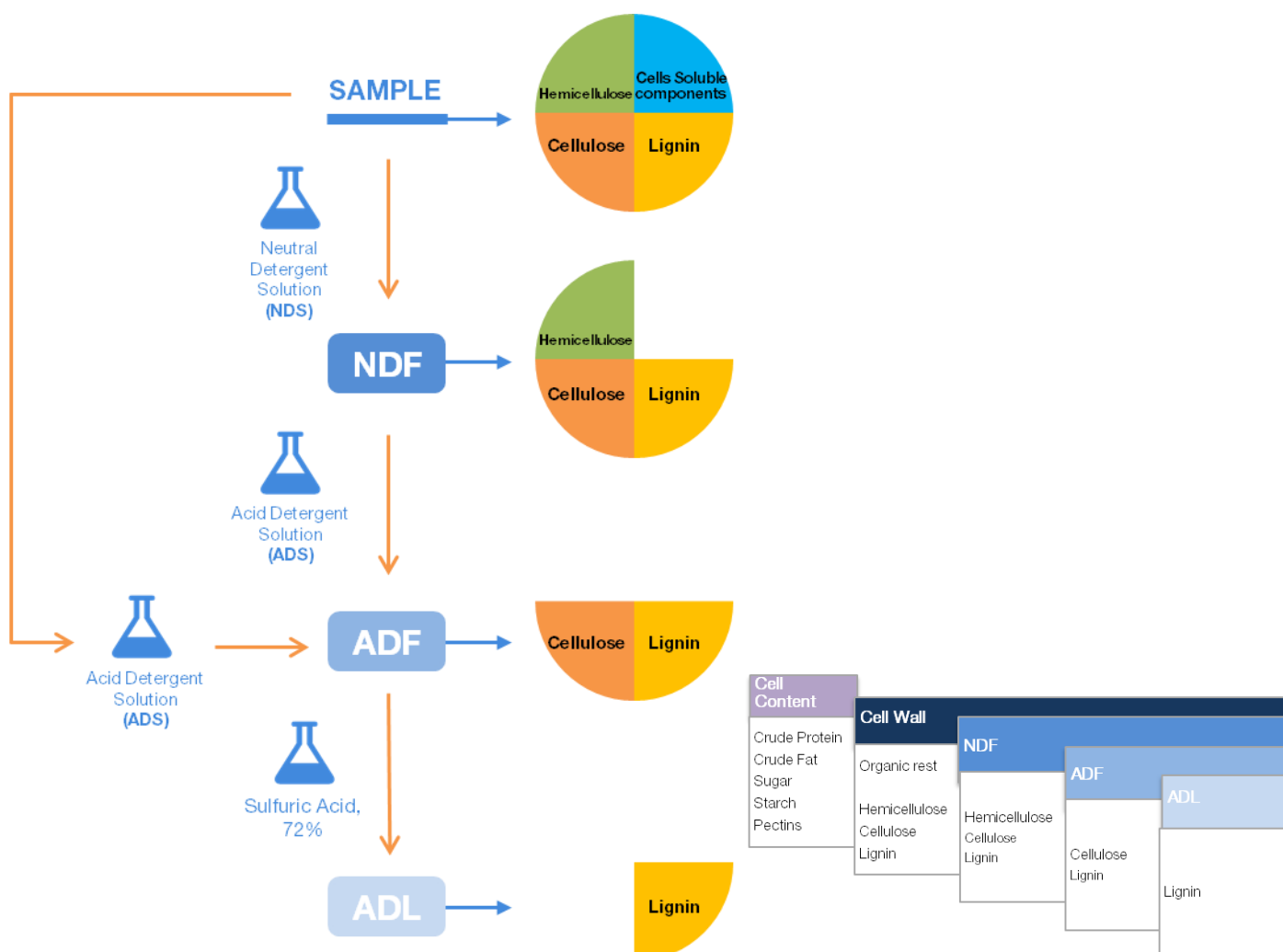
Introduction

The single most important determinant of forage quality is stage of maturity of the plant when harvested. Plants, like animals, grow and mature over time. The mature plant is one that has developed reproductive components to the point of generating seeds. Immature forage is the lush rapidly growing plant prior to reproductive parts (seeds, flowers) development. Mature plants contain greater amounts of cell wall structural components, and lignin for cell wall reinforcement.

These cell wall components allow the large mature plant to stand upright, rather than to fall over under its own weight. This increase in lignin and fiber results in a dilution of energy, protein and other nutrients as well as a decline in nutrient digestibility.

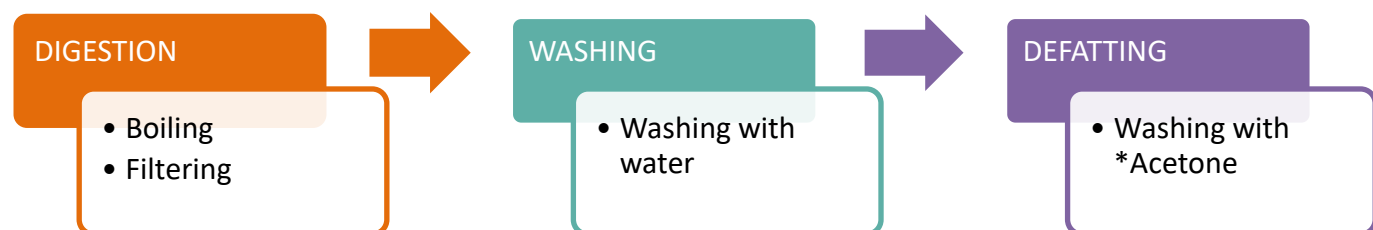
There is a close relationship between the crude fiber content and the nutrition value of the feed: the higher the crude fiber is, the lower the nutritional value is. Fiber is thus an important parameter to be determined in feed.

The performance of VELP FIWE Advance Fiber AutoExtractor was evaluated by participating in the **proficiency testing program organized by BIPEA**. Samples were analyzed using FIWE Advance Fiber analyzer and the obtained results were compared with the BIPEA tolerance range.



Determination of Acid Detergent Fiber content in different feed samples

The ADF determination can be summed up in 3 steps:



*performed with COEX

During BOILING & FILTERING (DIGESTION) the Acid detergent solution (ADS) solubilizes the hemicellulose while lignin and cellulose remain insoluble into the crucible.

During WASHING the residues into the crucibles are washed with water to remove detergent residues. The final step is the DEFATTING of the samples where the last washes are performed with acetone.

BIPEA Samples

Laying hen feed ID: 15-2413-0052
Fattening feed for cattle ID: 1-4213-2018

ADF assigned value: 5.8 %
ADF assigned value: 10.1 %

Tolerance range: 4.3 – 7.3 %
Tolerance range: 8.6 – 11.6 %

Chemicals and Equipment required

- Analytical balance, 4 decimals
- Glass Crucibles P2, 6pcs (A00000140)
- Acid Detergent Solution ADS.
- n-octanol as antifoaming agent
- Acetone, technical grade

Crucibles Preparation

Dry the crucibles in an oven at 102-105 °C for 2 h to 4 h and cool them in a dessicator. Connect the optional VELP barcode reader (Barcode scanner with USB socket Code: A00000364 or Wireless barcode scanner Code: A00000365) to the FIWE Advance. Select Analysis/Details, scan the crucible and weigh the tare (M_{tare}) to the nearest 0.0001 g. Then weigh 1 g of sample portion into each crucible (M_{sample}) and transfer the values from the balance to FIWE Advance. This operation is repeated sequentially for the remaining positions.

Include two blanks for the first 20 to 30 samples and add one blank for each additional 20 to 30 samples (B_{tare}).

Analysis with FIWE Advance

Select “Analysis” and standard method “ADF - Acid detergent fiber (Van Soest)” including the following parameters:

- Crucibles porosity P2
- Preheat: No
- ADS: 100 ml
- N-octanol: Yes
- Enzyme: No
- Digestion time: 60 minutes
- Washing: 3 x 50 ml ml of distilled water

Lower the lever and position the heating shield.

Press START to begin the process. At the end of analysis remove the crucibles from the unit, place them in COEX unit for defatting (25 ml acetone for 3 times) and dry them (130 °C \pm 2 °C for 2 h). Leave to cool in the desiccator. In Results menu select the crucibles batch ID analyzed, press calculate, scan the crucibles with barcode reader and weigh to the nearest 0,0001 g (M_{dry} and B_{dry}).

Results on feed samples

$$\text{ADF \%} = (M_{\text{dry1}} - M_{\text{tare}} - (B_{\text{dry1}} - B_{\text{tare}})) * 100 / M_{\text{sample}}$$

M_{dry} = sample weight after drying

M_{tare} = tare of the sample

M_{sample} = sample weight

B_{dry} = blank weight after drying

B_{tare} = tare of the blank

Sample	M_{tare} (g)	M_{sample} (g)	M_{dry} (g)	ADF %
Laying hen feed	31.6282	1.0021	31.6797	5.2590
	31.3739	1.0183	31.4328	5.2931
	31.6810	1.0364	31.7399	5.2007
			Average ± SD%	5.25 ± 0.05
			RSD% *	0.9
Fattening feed for cattle	29.4891	1.0081	29.5990	11.0207
	30.1385	1.0051	30.2468	10.8944
	30.2660	1.0016	30.3729	10.7927
			Average ± SD%	10.90 ± 0.11
			RSD% *	1.0

* RSD% = (Standard Deviation * 100) / Average

ADF Blank ($B_{\text{dry}} - B_{\text{tare}}$) results: - 0.0012 g

Conclusion

The obtained results are reliable and in accordance with the expected values, with a low relative standard deviation (RSD ≤1%), that means high repeatability of the results. The use of an extraction apparatus purposely devised for this method as FIWE Advance unit, makes very easy the standardization of analytical conditions.

Benefits of FIWE Advance are:

- 6 positions simultaneously and unsupervised
- Easy to use: 7" touch screen operation with preset method and favorite methods setting
- Automatic heating and dispensing of reagents avoiding any possible contact with chemicals and fumes
- State-of-the-art safety features controlling all the steps of the analysis
- Precision and accuracy: high reproducibility of the results: ± 1% relative or better
- Results in accordance with official procedures
- Connection to VELP Ermes cloud platform to monitor and control the instrument and to access to your database.

In order to avoid losses of fiber, it's important to remember that crucibles life is around 20-30 analysis, because the fritted filter could be damaged from basic and acid solutions. Hence it's suggested to change them after 20-30 analysis.