APPLICATION NOTE

F&F-F-004-2020/A1

NDF Determination in Feed

Neutral Detergent Fiber (Van Soest method)

Reference: **ISO 16472:2006** Animal feeding stuffs — Determination of amylase-treated Neutral Detergent Fibre content (aNDF)

AOAC 2002.04 Amylase-treated Neutral Detergent Fibre in Feeds

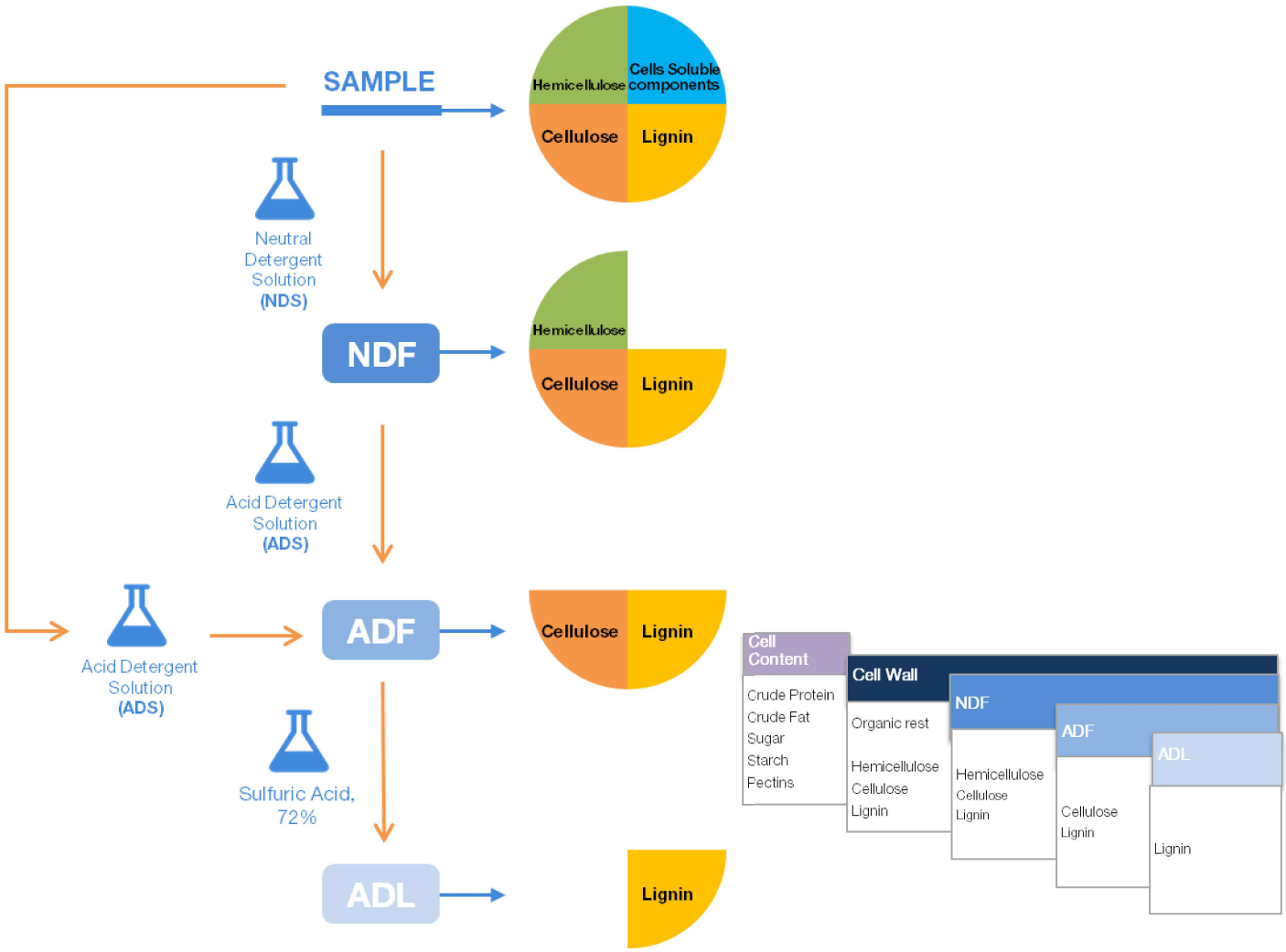
Tested with **VELP Scientifica FIWE Advance Fiber AutoExtractor** (Code F30500500).

VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com

aNDF DETERMINATION IN FEED

Introduction

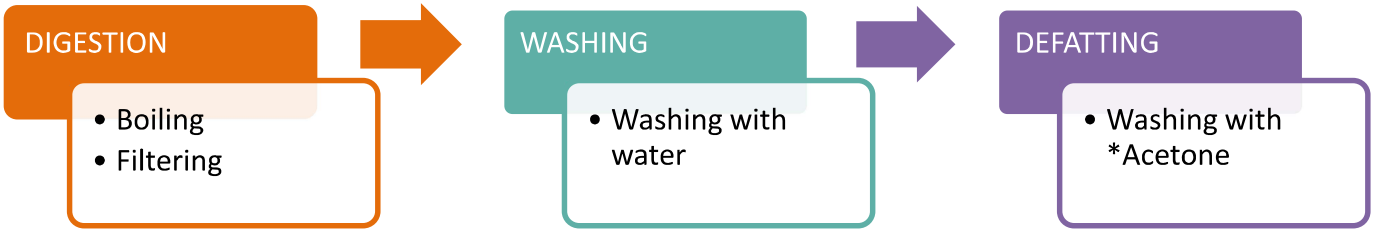
Forage quality is a direct reflection of its essential nutrient content and availability to the consuming animal.
The concept behind the detergent fiber analysis (NDF) is that plant cell substances can be divided into less digestible cell walls (made of hemicellulose, cellulose and lignin) and highly digestible cell contents (containing starch and sugars).
Hemicellulose, cellulose and lignin are indigestible in non-ruminants, while hemicellulose and cellulose are partially digestible in ruminants. NDF is a good indicator of the "bulk" fiber and has been used to predict feed intake, in other words, how much an animal will eat before its stomach is full.
The amylase-treated NDF (aNDF) method, therefore, was developed to measure the total insoluble fiber in feeds.
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.



VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com

Determination of NDF content in Triticale feed and Dehydrated alfalfa feed

The aNDF determination with FIWE Advance series can be summed up in 3 steps, for a fully unattended operation:



*performed with COEX

During BOILING & FILTERING (DIGESTION) the feed sample is boiled in the Neutral Detergent Solution NDS with heat-stable α-amylase-treated enzyme to separate the neutral detergent soluble fraction (sugars, starches and pectine soluble, filtered) from the neutral detergent insoluble fraction (cell walls substances, hemicellulose, cellulose and lignin, residues). The cell contents are highly digestible (about 98 %) and include various sugars, starches, pectins and other soluble carbohydrates, proteins, non-protein nitrogenous compounds, lipids, water-soluble minerals and vitamins.
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

Triticale	ID: 6-3813-0027	NDF assigned value: 12.6 %	Tolerance range: 11.1 – 14.1%
Dehydrated alfalfa	ID: 8-1413-0195	NDF assigned value: 38.8 %	Tolerance range: 36.8 – 40.8%

Chemicals and Equipment required

- Analytical balance, 4 decimals
- Glass Crucibles P2, 6pcs (A00000140)
- Neutral detergent solution NDS.
- Heat-stable alpha-amylase, as a solution or a water extract of lyophilised enzyme powder (approx. 1 g of powder extracted in 100 ml of water).
- Sodium sulfite anhydrous (Na_2SO_3)
- Acetone, technical grade

Crucibles Preparation

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, weigh 0.5 g of sample portion into each crucible (M_{sample}) and transfer the M_{sample} value from the balance to FIWE Advance. Then weigh 0.5 g of Sodium sulfite anhydrous. This operation is repeated sequentially for all the remaining positions. Include two blanks for 20 to 30 samples.

Analysis with FIWE Advance

On the ControlPad select “Analysis”, and then method “NDF - Neutral detergent fiber (Van Soest)” including the following parameters:

- Crucibles porosity P2
- Preheat: No
- NDS: 50 ml
- Octanol: Yes
- Enzyme: Yes

VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com

- Digestion time: 60 minutes
- Washing: 50 ml of distilled water for 3 times

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 ± 2 °C for 2 h). Leave to cool in the desiccator. In Result menu select the crucibles batch ID analyzed, press calculate, scan the crucibles with barcode reader and weigh to the nearest 0,0001 g (Mdry and Bdry).
Ignite the crucible with the residue in a muffle (525 ± 15 °C) for at least 3 h or until carbon-free. Leave to cool in a desiccator. In Result menu select the crucibles batch ID analyzed, press calculate, scan the crucibles with barcode reader and weigh to the nearest 0,0001 g (Mash and Bash).

Results on Triticale feed and Dehydrated alfalfa feed

$$\text{aNDF \%} = (M_{dry} - M_{ash} - (B_{dry}-B_{ash})) * 100 / M_{sample}$$

M_{dry} = sample weight after drying
M_{ash} = sample weight after ashing
M_{sample} = sample weight
B_{dry} = blank weight after drying
B_{ash} = blank weight after ashing

Sample	M_{sample} (g)	M_{dry} (g)	M_{ash} (g)	aNDF %
Triticale	0,5475	31,2693	31,1986	12,60%
	0,5148	30,8355	30,7691	12,57%
	0,5112	30,4190	30,3537	12,44%
			Average ± SD%	**12.50 ± 0.08**
			RSD% *	**0.68**
Dehydrated alfalfa	0,5110	31,6367	31,4316	39,80%
	0,50796	30,9916	30,7871	39,92%
	0,5044	31,089	30,8891	39,29%
			Average ± SD%	**39.67 ± 0.34**
			RSD% *	**0.84**

* RSD% = (Standard Deviation * 100) / Average
aNDF Blank (B_{dry}-B_{ash}) results: + 0.0017 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.

VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com

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.

VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com