

Crude Fiber Determination in Feed according to the modified Scharrer method

Reference: **ISO 6541:1981** Agricultural food products - Determination of crude fibre content - Modified Scharrer method

Tested with **VELP Scientifica FIWE 3 Fiber Analyzer** (Code F30520201).



Introduction

Fiber is the part of fruits and vegetables (lignin, cellulose, hemicellulose, pectin) that cannot be digested and assimilated by the human gastrointestinal tract. However, fiber analysis is important for:

- nutritional purpose, as a certain amount of fiber is necessary for good functioning of the digestive tract;
- economic reason, as manufacturers of food and animal feeds use as much fiber as a raw material as they are allowed since it is a low-cost component.
- legal aspects, as law authorities of almost all Countries require food and feed manufacturers to declare the fiber content on the packaging as part of nutritional labelling.

Chemically, fiber is defined as indigestible residue, after boiling with diluted solutions of strong mineral alkalies and acids.

Fiber Determination in soy feed according to the modified Scharrer method

The Fiber Determination using Scharrer reagent consists in boiling the sample with a mixture of acetic acid, nitric acid and trichloroacetic acid, followed by the separation and washing of the insoluble residue on a filter crucible. Drying and weighing of the insoluble residue and the determination of the loss of mass after 3 hours in the muffle at 550 °C.

Reagents

1- Scharrer reagent consisting of a mixture having the following composition:

- Acetic acid solution prepared by diluting 365 ml of 96% glacial acetic acid with distilled water to 500 ml
Used 450 ml of this solution
- Concentrated nitric acid: 30 ml
- Trichloroacetic acid, crystalline: 12 g

2- Celite coarse 545

3- Acetone

4- Diethyl ether

Analysis Procedure

The diagram below shows the steps involved in the procedure:



Grind the sample using a grinder (particle size 1mm).

Weigh into the crucible accurately 1 g of celite and 3 g of homogeneous grinded sample (**W1**) with an accuracy of ± 1 mg and position the crucible (P2 type - Code A00001140) into the FIWE unit.

The sample must be homogeneous.

Add 60 ml of cold Scharrer reagent and boil 30 minutes exactly from the onset of boiling.

Connect to vacuum for draining the acid.

Wash with ~ 400 ml of deionised water, using the water spray device and, if necessary, use air in order to separate the compact content of crucible from the bottom and to crumble it .

VELP Water Spray device ensures a homogeneous distribution of water along the glass walls and enables a complete cleaning of glass condensers, in this way every possible trace of the digested sample is completely removed.

Wash three times with 25 ml of acetone and two times with 25 ml of diethyl ether. After draining the last wash, remove the crucibles and determine the dry weight after drying in an oven at 130 °C for 90 minutes.

Let cool the crucibles in a desiccator up to constant weight. This weight represents the crucible containing crude fiber and ashes (**W2**).

Place the crucibles in a muffle at 550 °C, starting from room temperature, for three hours and reweigh after cooling in a desiccator. This weight represents the crucible containing ashes (**W3**).

Calculation

$$\% \text{ Fiber} = ((W2 - W3) / W1) * 100$$

W1 = sample weight (1g)

W2 = crucible weight with fiber and ashes, after drying in an oven at 130 °C for 90 minutes

W3 = crucible weight with ashes, after muffle at 550 °C for three hours

Typical Results on Soy Feed (repeated twice)

W1 (g)	W2 (g)	W3 (g)	Fiber %
2.999	31.778	31.411	12.24
3.006	31.208	30.840	12.24
3.007	31.380	31.015	12.14
3.016	31.524	31.154	12.27
3.017	31.239	30.870	12.23
2.996	32.063	31.691	12.42
		Average ± SD%	12.26 ± 0.09
		RSD% *	0.7

Fiber Labeled Value: 12%

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

Conclusion

The obtained results are reliable and in accordance with the labeled value.

The use of an extraction apparatus purposely devised for this method as FIWE unit makes very easy the standardization of analytical conditions.

The FIWE Series is suitable for raw fiber determination and it is ideal for Scharrer method.

Benefits of FIWE are:

- 3 or 6 positions simultaneously: FIWE units can support up to 3 (FIWE 3) or 6 (FIWE 6) crucibles. Samples can also be processed individually
- Time saving: fast analysis (2 hours with FIWE vs. 6 hours manually)
- Easy to use: convenient filtration, with pump and air pressure
- Precision and accuracy: high reproducibility of the results: **±1%** relative or better

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