Fat determination in high-fiber low-fat samples

Extraction Unit E-816 SOX:
Fat Determination in High-Fiber Low-Fat samples according to Weibull-Stoldt

The determination of fat in food is routinely used in quality assurance and for labelling. Due to the voluminous nature, high-fiber samples with low-fat content need more attention during the hydrolysis. Below, a reliable procedure for fat determination in high-fiber low-fat samples is introduced. The sample is hydrolyzed with hydrochloric acid using the Hydrolysis Unit E-416, followed by a Soxhlet extraction with the Extraction Unit E-816 SOX. The determined fat contents correspond well to the labelled values.

1. Introduction

Fat determination is one of the key analysis performed in the food industry. The samples are hydrolyzed with hydrochloric acid to break the chemically bound and naturally encased fat from the matrix. Afterwards, the fat is extracted with a suitable solvent using Soxhlet extraction. The extract is then dried to a constant weight and the total fat content is determined gravimetrically.

2. Experimental

Equipment: Mixer B-400, Hydrolysis Unit E-416, Extraction Unit E-816 SOX

Samples: High fiber samples with low fat contents between 1.7 - 4.0 %.

Determination: 20 g of quartz sand was added to a glass sample tube and 2 g Celite® 545 was placed on top. The samples were homogenized and weighed into digestion vessels containing 2 g of Celite® 545. After adding 100 - 200 mL hydrochloric acid (4 M) into each vessel the samples were hydrolyzed for 30 min using the E-416. The hydrolyzate was transferred and the vessels were washed with warm (40 - 50 °C) deionised water until a neutral pH was obtained.

The glass sample tubes were dried in a vacuum oven, drying oven or microwave oven. After cooling down in a desiccator, another layer of quartz sand (20 g) was added to the sample tube prior to the extraction. The extraction was performed using the E-816 SOX applying the parameters specified in Table 1.

Table 1: Method parameters for the extraction using the Extraction Unit E-816 SOX

Method parameters	
Solvent	Petroleum ether
Extraction step	120 min / 20 cycles (Heater 100 %)
Rinsing step	5 min (Heater 100 %)
Drying step	20 min (Heater 100 %)
Solvent volume	140 - 160 mL

The samples were extracted in duplicate. The extracts were dried to a constant weight in a drying oven at 102 °C and the total fat content was calculated.

Figure 1: Extraction Unit E-816 SOX

3. Results

The determined fat contents are shown in Table 2. The results obtained with the Extraction Unit E-816 SOX correspond well with the labelled values. The results show low relative standard deviations.

Table 2: Determined fat content in high-fiber low-fat samples, fat in g/100 g, n=2

	Fat content (g/100 g)	Labelled value (g/100 g)
Organic millet flakes	**2.11**	**2.0**
Wheat bran	**4.27**	**4.0**
Crispbread	**1.57**	**1.7**
Browntop millet	**3.06**	**3.5**

4. Conclusion

The determination of fat content in various high-fiber low-fat samples using the Hydrolysis Unit E-416 and the Extraction Unit E-816 SOX was performed according to Weibull-Stoldt. It provided reliable and reproducible results. It is important, due to the voluminous sample that particular care is taken during the hydrolysis step.

The measured fat content corresponded well to the labelled content.

5. References

· Operation Manual of Mixer B-400
· Operation Manual of Hydrolysis Unit E-416
· Operation Manual of Extraction Unit E-816 SOX

For more detailed information and safety considerations please refer to the Application Note no. 196/2015.