Fat determination in bakery product and chocolate by Hot Extraction

FatExtractor E-500: Hot Extraction after hydrolysis with the HydrolEx H-506

A simple and fast procedure for fat determination is introduced. The sample is hydrolyzed with the HydrolEx H-506, followed by an extraction with the FatExtractor E-500 Hot Extraction. The total fat content is determined gravimetrically, after the extract has been dried to a constant weight. This application follows official methods (ISO 1444:1996, ISO 11085:2016, AOAC 2003.05, AOAC 991.36).

1. Introduction

Fat determination is one of the key analysis performed in the food industry. The samples require a hydrolysis step with hydrochloric acid to break the chemically bound and naturally encased fat from the matrix. Afterwards, the fat is extracted with a suitable solvent according to Hot Extraction. After the extract has been dried to a constant weight the total fat content is determined gravimetrically.

2. Experimental

Equipment: HydrolEx H-506, FatExtractor E-500 Hot Extraction

Samples: Cookie LUV No. 17-11 with a certified fat content of 27.47 g/100 g (+/- 0.311 g/100 g), Chocolate LVU No. 17-13 with a certified fat content of 30.93 g/100 g (+/- 0.356 g/100 g).

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 weighed into a hydrolysis vessel containing 2 g of Celite®. After adding 2 x 50 mL hydrochloric acid (4 M) into each vessel the samples were hydrolyzed for 30 min using the H-506. The hydrolyzate was transferred and the vessels washed with warm (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. The extraction was performed using the E-500 (Figure 1) applying the parameters specified in Table 1.

Table 1: Parameters for the extraction with the FatExtractor E-500 HE

Method parameters	
Solvent	Petroleum ether / Hexane / Diethyl ether / Chloroform[1]
Extraction step	5 min (heating level 4 - 8[2])
Rinse step	30 min (heating level 5 - 8[1])
Drain	3
Drying step	3 min (heating level 3 / 5[1])
Solvent volume	50 mL

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

Figure 1: FatExtractor E-500 HE.

3. Results

The determined fat contents are presented in Table 2. The results correspond to the certified values of the reference materials. The determinations show low relative standard deviations.

Table 2: Determined fat content in bakery product and chocolate, fat in g/100 g (relative standard deviation in brackets), n=3.

Solvent	Cookie	Chocolate
Petroleum ether	27.15 (0.83)	30.57 (0.18)
Hexane	27.18 (0.82)	30.90 (0.63)
Diethyl ether	27.19 (0.31)	30.73 (0.43)
Chloroform	27.42 (0.77)	30.90 (0.53)

4. Conclusion

The determination of fat in different bakery product and chocolate using the HydrolEx H-506 and the FatExtractor E-500 provides reliable and reproducible results. These results correspond well to the labelled values, with low relative standard deviations (rsd).

5. References

[1] ISO 1444:1996 Meat and meat products – determination of free fat content
[2] ISO 11085:2016 Cereals, cereals-based products and animal feeding stuffs -- Determination of crude fat and total fat content by the Randall extraction method
[3] AOAC 2003.05 Crude Fat in Feeds, Cereal Grains, and Forages
[4] AOAC 991.36 Fat (Crude) in Meat and Meat Products

For more detailed information and safety considerations please refer to the Application Note No. 356/2019.

[1] Please select the solvent used in the menu.

[2] Heating level proposed by the system depending on the selected solvent.