Fat determination in fish products

Extraction Unit E-816 ECE:
Fat determination in fish products using Twisselmann extraction

The determination of fat in food is a routine procedure used in quality assurance and for labelling. Below, a facile procedure for fat determination in fish products is presented. The sample is hydrolyzed with hydrochloric acid using the Hydrolysis Unit E-416, followed by a Twisselmann extraction with the Extraction Unit E-816 ECE (Economic Continuous Extraction).

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 according to Twisselmann. With this extraction technique the sample is constantly kept in hot vapor whilst being efficiently rinsed with freshly distilled solvent. After the extract has been dried to a constant weight the total fat content is determined gravimetrically.

2. Experimental

Equipment: Mixer B-400, Hydrolysis Unit E-416, Extraction Units E-816 ECE.

Samples: Fish products with labelled fat contents of 7.2 % and 1.6 % (Figure 1). Prior to analysis approx. 50 g of the sample are homogenized using Mixer B-400.

Figure 1: Fried mackerels and albacore tuna

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 mixed with the Mixer B-400 and weighed into digestion vessels 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 E-416. The hydrolyzate was transferred and the vessels 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. The extraction was performed using the E-816 ECE (Figure 2) by applying the parameters specified in Table 1.

Figure 2: Extraction Unit E-816 ECE (Economic Continuous Extraction)

Table 1: Parameters for the extraction using the Extraction Unit E-816 ECE.

Method parameters	
Solvent	Petroleum ether
Extraction step	60 min (Heater 100 %)
Drying step	10 min (Heater 100 %)
Solvent volume	70 mL

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

3. Results and Discussion

The determined fat contents obtained with the Extraction Unit E-816 ECE are shown in Table 2. The measured fat contents are well comparable to the labelled fat content and they show low relative standard deviations.

Table 2: Determined fat content in fried mackerels and albacore tuna, n=3. Labelled fat content: 7.2 g /100 g and 1.6 g /100 g.

	Fried mackerels [g/100 g]	Albacore tuna [g/100 g]
Sample1	7.46	2.22
Sample2	7.49	2.23
Sample3	7.43	2.23
Mean value	**7.46**	**2.23**
rsd [%]	**0.45**	**0.25**

4. Conclusion

The determination of fat content in fish products using Twisselmann extraction on the E-816 ECE provides reliable and reproducible results. Extraction according to Twisselmann is applicable to analyze the fat content in sampels of low and higher fat concentrations.

5. References

For more detailed information and safety considerations please refer to the Application Note No. 202/2015.