

Fat determination in coffee

*Extraction Unit E-816 ECE:
Fat determination in coffee 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 coffee is presented. The sample is hydrolyzed with hydrochloric acid using the Hydrolysis Unit E-416, followed by a Twisselmann extraction applying the Extraction Unit E-816 ECE (Economic Continuous Extraction). For comparison, fat determination was performed without a prior hydrolysis step.

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 organic 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: Hydrolysis Unit E-416, Extraction Unit E-816 ECE.

Samples: Rioba roasted and ground coffee with labelled fat content of 8.5 g/100 g. Mocca roasted coffee with labelled fat content of 11.9 g/100 g.

Determination: 20 g of quartz sand was added to a glass sample tube and 5 g Celite® 545 was placed on top. The samples were 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 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 1) by applying the parameters specified in Table 1.



Figure 1: Extraction Unit E-816 ECE.

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

Solvent	Petroleum ether
Extraction step	50 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 hydrolysis and without hydrolysis are compared in Table 2. The difference between the found and labelled fat content could be explained by the fact that for the determination of the fat content in coffee without a hydrolysis step only the easily accessible fat (free fat) is extracted. For the fat determination with a prior hydrolysis the total fat content is determined.

However, the determined fat content of the sample correspond to the range for roast ground coffee from 8.3 % to 14.8 % found in literature [1]. Furthermore, the results show low relative standard deviations (<1 %).

Table 2: Fat content with hydrolysis and without hydrolysis in rioba roasted and ground coffee and mocca roasted coffee, n=3. Labelled fat content: 8.5 g /100 g and 11.9 g /100 g.

Sample	With hydrolysis Fat [g/100 g]	Without hydrolysis Fat [g/100 g]
Rioba roasted and ground coffee	13.97	10.04
Mocca roasted coffee	14.75	11.78

4. Conclusion

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

5. References

[1] Souci, S.W.; Fachmann, W.; Kraut, H.; Food composition and Nutrition Tables; medpharm Scientific Publishers; Stuttgart 2000; ISBN 3-88763-076-9

For more detailed information and safety considerations please refer to the Application Note No. 208/2016.