Determination of total fat content in plant-based meat substitutes

HydrolEx H-506, FatExtractor E-500: Total fat determination in food samples according to Weibull-Stoldt

A simple and reliable procedure for determination of fat content in different plant based meat samples according to Weibull-Stoldt Extraction is introduced. Vegan nutrition and sustainable plant-based protein sources are increasingly demanded by consumers. The samples are hydrolyzed using the HydrolEx H-506. The extraction is performed with the FatExtractor E-500 Soxhlet. This application complies with official methods (AOAC 963.15, ISO 22630:2015, AOAC 991.36). The presented application gives reliable and highly reproducible results. The total extraction time is less than 90 min for six samples.

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 Soxhlet. 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 Soxhlet

Samples (labelled fat content): Soy Schnetzel. (2.3 %); Boiled sausage, based on Tofu /wheat protein (17 %); Vegan steak, based on soy and wheat protein, (10,8 %); Vegan fish sticks, based on wheat protein (9.3 %); Vegan cold cuts type Lyoner, based on soy and pea protein (12 %)

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 100 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) deionized 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-500 (Figure 1) applying the parameters specified in Table 1.

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

Method parameters	
Solvent	Petroleum ether
Extraction step	20 cycles (heating level 6)
Rinse step	5 min (heating level 6)
Drying step	SmartDrying
Solvent volume	100 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 SOX

3. Results

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

Table 2: Determined fat content in plant-based meat substitutes, fat in g/100 g (relative standard deviation in brackets), n=3

	Fat content (g/100g)
Soy schnetzel	**1.66** (4.45%)
Boiled sausage	**16.77** (0.59%)
Vegan steak	**11.79** (0.77%)
Vegan fish sticks	**14.07** (0.89%)
Vegan cold cuts type Lyoner	**12.07** (0.64%)

4. Conclusion

The determination of fat in different plant-based meat samples using the HydrolEx H-506 and the FatExtractor E-500 provides reliable and reproducible results.

With the FatExtractor E-500 Soxhlet, the time per cycles is reduced significantly. The total extraction time is less than 90 70 min.

5. References

[1] EN 98/64/EG Commission Directive 98/64/EC Fat in feeding stuffs
[2] AOAC 963.15 Fat in Cacao Products
[3] ISO 22630:2015 Oilseed meals – Determination of oil content – Rapid extraction method
[4] AOAC 991.36 Fat (crude) in meat and meat products
[5] Application note 365/2019 – Crude fat determination in feed samples. See www.buchi.com/application

For more detailed information and safety considerations please refer to the Application Note No. 387/2020.