

Free fatty acid determination in flour and brewer's spent grain samples *FatExtractor E-500: Free fatty acid and crude fat content determination*

1. Introduction

During processing or storage, oils and fats get hydrolysed, resulting in free fatty acids (FFA). Oxidized FFA's smell rancid and are therefore a key factor for oil and fat quality [1]. The amount of FFA is a quality factor as it increases during storage and has also an impact on the rheological properties of flour-water doughs [2]. The determination of its content is therefore of great importance. In the presented application, the samples are extracted using the FatExtractor E-500 Soxhlet, followed by a titration to determine the FFA content.

2. Experimental

Equipment: FatExtractor E-500 Soxhlet, with Standard interface and Analyte protection sensor, 877 Titrino plus (Metrohm) with Solvotrode 6.0229.010 pH electrode for non-water acid- base titrations

Samples:

- Flour samples, BIPEA Proficiency Test PT 02-Code 0102
- Brewer's grain, two different samples

Extraction: 10 g homogeneous sample was weighed into a 33x94 mm cellulose thimble, approx. 10 g sodium sulfate was added and mixed it well with a spatula. The samples were extracted using the FatExtractor E-500, applying the parameters specified in Table 1.

Table 1: Parameters for the Soxhlet Extraction with the FatExtractor E-500

Step	Time [min] / No. of cycles [-]	Heating level [-]
Solvent	Petroleum ether	
Extraction	20 cycles	6
Rinse	5 min	6
SmartDrying	on	-
Solvent volume [mL]	100	



3. Results

The determined FFA content is presented in Table 2. All samples are analysed in triplicates. The determined fatty acid content corresponds well within the proficiency test with low relative standard deviations (rsd).

Table 2: Determined FFA content in flour and brewer's spent grain (rsd: relative standard deviation), n=3

Sample	Mean value [mg / 100 g]	rsd	Assigned Value
Flour sample 173-0102	32.15	0.83%	37 ± 5
Flour sample 174-0102	48.30	1.05%	44 ± 5
Flour sample 175-0102	35.80	0.82%	43 ± 5
Flour sample 176-0102	39.88	0.78%	45 ± 5
Brewer's Grain 1	13.14%	0.55%	11% – 16.3%
Brewer's Grain 2	16.91%	0.56%	11% – 16.3%

4. Conclusion

The determination of the free fatty acid (FFA) content by use of the FatExtractor E-500 provides reliable and repeatable results. These results correspond well to the expected values with low relative standard deviations (rsd).

5. References

- [1] Mahesar S. A. et al., Analytical approaches for the assessment of free fatty acids in oils and fats, Analytical Methods, 6, 4956-4963, 2014.
- [2] Morrison W., On the free fatty acids of wheat flour. With reference to their contribution to chemical changes which occur during the mixing of doughs, PhD thesis, University of Glasgow, 1963.

For more information, please refer to Application Note 796/2022.