

Determination of Oil in Soybeans according to Ac 3-44

FatExtractor E-500 ECE: Determination of oil content in a soybeans sample by continuous extraction according to AOCS Ac 3-44

A simple and reliable procedure for the oil determination in a soybeans sample is introduced. This Application Note follows the official method AOCS Ac 3-44 by the American Oil Chemists' Society [1]. The standard method requires an extraction with a Butt-type extraction apparatus with an extraction time of 5 h. The Butt-type extraction is equal to the Twisselmann extraction method used in the FatExtractor E-500 ECE.

Both, the Butt-type extractor as well as the Economic Continuous Extraction (ECE) are continuous extractions where the sample is constantly kept in hot solvent vapor whilst efficiently rinsed with freshly distilled solvent. The oil content is determined gravimetrically after the extract has been dried to a constant weight.

1. Introduction

This Short Note shows by means of a certified reference material sample that reliable and reproducible results will be received using the FatExtractor E-500 ECE.

In a second step this Short Note shows that an extraction time of 1 h is sufficient to receive reliable and reproducible results for the oil determination in soybeans samples using the FatExtractor E-500 ECE.

2. Experimental

Equipment: FatExtractor E-500 Economic Continuous Extraction, Recirculating Chiller F-308.

Sample: Soybeans, AOCS reference material 10 Soybeans 2019-2020, sample 1, expected oil content: 20.19 % (limit of tolerance: 19.27 – 21.11 %)

Procedure: The soybeans sample was dried in a drying oven to determine the moisture content. The pre-dried sample was homogenized. 2 g of the homogenous sample was weighed into a cellulose thimble. The sample was extracted using the FatExtractor E-500 ECE (see Figure 1) applying the parameters specified in Table 1.

Table 1: Parameters for E-500 ECE, following AOCS Ac 3-44

Step	Value	Heating level
Solvent	Petroleum ether	
Extraction	300 min	6
SmartDrying	on ¹	-
Solvent volume [mL]	70	

The extracts were dried to a constant weight in a drying oven at 102 °C, cooled down to ambient temperature in a desiccator, weighed and the oil content of the soybeans was calculated. This calculation is considered to the non-dried soybeans sample.

3. Results

The determined oil content of the soybeans sample is in good correlation to the certified reference value. The result is shown in Table 2.

¹ Instead of using SmartDrying it is possible to use the following drying parameters. Then, SmartDrying is switched off: Petroleum ether: 12 min



Figure 1: FatExtractor E-500 ECE

Table 2: Oil content of soybeans sample, determined with FatExtractor E-500 ECE, n = 6.

Sample	Oil content [%]	Rsd [%]	Expected oil content [%] (limit of tolerance [%])
Soybeans	20.46	0.76	20.19 % (19.27 – 21.11 %)

4. Method optimization

AOCS Ac 3-44 requires a Twisselmann extraction of 5 h. It is shown that the extraction time can be reduced to 1 h receiving reliable and reproducible results. A comparison of the results with 5 h and 1 h extraction time is shown in Figure 2.

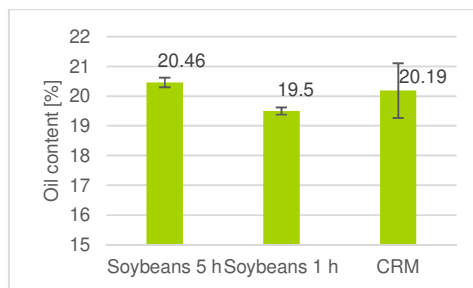


Figure 2: Comparison of oil contents in soybean samples determined with different extraction times using the E-500 ECE

5. Conclusion

The determination of the oil content in a soybeans sample following AOCS Ac 3-44 using the FatExtractor E-500 ECE provides reliable and reproducible results. The determined oil content of the certified reference material sample correspond well to the declared value with low relatively standard deviations.

The AOCS method Ac 3-44 requires a continuous extraction of 5 h. This Short Note shows that the extraction time can be reduced to 1 h receiving reliable and reproducible results using the FatExtractor E-500 ECE.

6. References

[1] AOCS Official Method Ac 3-44: Oil in Soybeans, Reapproved 2017.

For more detailed information and safety considerations please refer to the Application Note No. 396/2020.