Determination of Oil Content in Oilseeds with Pressurized Solvent Extraction

SpeedExtractor E-916, SyncorePlus Polyvap:
Pressurized Solvent Extraction of oilseed meals for the determination of oil content

A simple and reliable procedure for the oil determination in seed meal samples using Pressurized Solvent Extraction is introduced. This Short Note demonstrates that equivalent results are obtained as by continuous solvent extraction according the official method AOCS Ba 3-38 [1].

The standard method AOCS Ba 3-38 requires an extraction with a Butt-type extraction apparatus with an extraction time of 3 h. The oil content is determined gravimetrically after the extract has been dried to a constant weight. In the presented Short Note, the total extraction time is only 45 min.

1. Introduction

This Short Note shows by means of certified reference material samples reliable and reproducible results will be received using the SpeedExtractor E-916.

2. Experimental

Equipment: SpeedExtractor E-916, SyncorePlus Polyvap

Samples: AOCS reference materials: Cottonseed meal, expected oil content: 2.47 % (limit of tolerance: 2.16 - 2.77 %); Canola meal, expected oil content: 3.73 % (limit of tolerance: 3.45 – 4.00 %); Soybean meal, expected oil content: 1.22 % (limit of tolerance: 0.89-1.55 %).

Preparation of the extraction cells: Weigh in 5 g of sand. Approx. 4 g of sample were mixed with 3 g of Celite, mixed and transferred quantitatively into the extraction cells. The void was filled up with Celite.

The extractions were performed in duplicate using the SpeedExtractor E-916 applying the parameters specified in Table 1.

Table 1: Parameters for SpeedExtractor E-916

Parameter	Value
Temperature	60 °C
Pressure	100 bar
Solvent	Petroleum ether 40-60° (100%)
Cell size	20 mL
Vial size	60 mL
No. of Cycles	3
Heat up-time	1 min / 1 min / 1 min
Hold time	5 min / 5 min / 5 min
Discharge	2 min / 2 min / 3 min
Flush with solvent	1 min
Flush with gas	2 min
Total Extraction time	45 min

The extracts were evaporated to dryness using a SyncorePlus Polyvap. The amount of total lipids was then determined gravimetrically. The calculation of the results was done according to AOCS method Ba 3-38.

Figure 1: SpeedExtractor E-916

3. Results

The results of the fat determination in oilseeds using SpeedExtractor E-916 were comparable to those determined with the reference method, see Table 2.

Table 2: Determined fat contents, based on dry matter [%, +/- SD] on oil seed meals reference materials

Method	SpeedExtractor	Reference value (Tolerance limits)
Cotton seed meal		
Replicate 1	2.61 %	
Replicate 2	2.60 %	
Mean value	**2.61 %** (0.16% rsd)	2.47 % (2.16-2.77%)
Canola meal		
Replicate 1	3.66 %	
Replicate 2	3.64 %	
Mean value	**3.65 %** (0.21 % rsd)	3.73 % (3.45-4.00%)
Soy bean meal		
Replicate 1	1.21 %	
Replicate 2	1.24 %	
Mean value	**1.23** (1.05% rsd)	1.22 % (0.89-1.55%)

4. Conclusion

The fat contents determined by Pressurized Solvent Extraction using BUCHI's SpeedExtractor E-916 correspond to those obtained with reference methods. The extraction times are much shorter when compared with the standard method and in the same range as for the automated continuous extraction using the FatExtractor E-500 (please refer to BUCHI application notes 389/2020 [2]).

5. Acknowledgements

We gratefully thank Mr. Patrick Leibbrand and Mrs. Lilian Sohdo from Buhler group Uzwil for the fruitful collaboration to establish this Short Note.

6. References

[1] AOCS Official Method Ba 3-38: Oil in Seed Meals and Cakes, Revised 2017

[2] BUCHI Application Note 389/2020 Determination of oil in oilseed meals.