
Crude Fat Determination in Oatmeal according to the Randall method

Reference: AOAC 2003.05 Crude Fat in Feeds, Cereal Grains, and Forages;

Tested with VELP Scientifica SER 158/6 Solvent Auto Extractor (Code S303A0380)

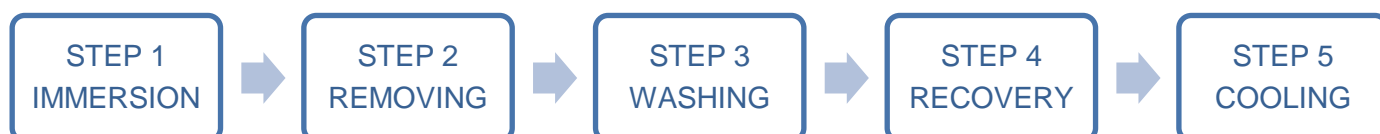


Introduction

The oat (*Avena sativa*), sometimes called the common oat, is a species of cereal grain grown for its seed, which is known by the same name (usually in the plural, unlike other cereals and pseudocereals). Oats also is a good source of energy and contain higher content of fats than other cereal grains unsaturated fatty acids^[1]. While oats are suitable for human consumption as oatmeal and rolled oats, one of the most common uses is as livestock feed.

Fat Determination in Oatmeal

Hot solvent extraction process with SER 158 Series can be summed up in 5 steps, for a fully unattended operation:



During IMMERSION the sample is immersed in boiling solvent. Then the REMOVING step automatically lowers the level of the solvent to below the extraction thimble. During WASHING the condensed solvent flows over the sample and through the thimble to complete the extraction process. The fourth step involves solvent RECOVERY. Approximately 90% of the solvent used is collected in the internal recovery tank. The final step is the COOLING of the extraction cups containing the extracted matter. The cups are raised to prevent burning. The extraction cups containing the extract are placed in a drying oven, cooled in a desiccator and weighed for the extract percentage calculation.

Sample

Oatmeal → Fat labeled value: $2.7 \pm 0,5\%$

Chemicals and Equipment Required

- Analytical balance, 3 decimals;
- Extraction thimbles (33x80 mm) (Code A00000295);
- Glass extraction cups (Ø56x120mm);
- Viton seals (Code A00000297);
- Petroleum Ether 40÷60°C as solvent.

Sample Preparation

Fix every Extraction thimbles with the Extraction thimbles holders (Code A00000312). Mix the sample with a spatula in order to take a representative part. Then, weight 5g of sample (*Sample*) directly in the VELP extraction thimbles using the Thimble weighing cup (Code A00000310).

Glass Extraction Cups Preparation

- Position the empty extraction cups in a drying oven (105 °C) for 1 hour.
- Cool them in a desiccator until constant weight of the tare (*Tare*).
- The extraction cups containing the extraction thimble can now be placed on the ultra-fast heating plate of SER158.

¹ (Zhou et al., 1999)

Extraction Procedure with SER 158

On the ControlPad select “*Analysis*”, and then create a method in a customer panel including the following parameters:

- Immersion Time: 60 minutes
- Removing Time: 10 minutes
- Washing Time: 60 minutes
- Recovery Time: 20 minutes
- Cooling Time: 5 minutes
- Petroleum Ether: 40-60 °C, 100 ml

Close the safety guard and add the solvent using the automatic solvent dispensing system SolventXpress™ to minimize exposure to the solvent ensuring operator safety.

Press START to begin the extraction process. At the end of analysis position the extraction cups containing the extract in a drying oven (1 hour at 105 °C), cooled them in a desiccator to room temperature and record the accurate weight (*Total*).

Typical Results on Oat Meal

Analysis results are calculated automatically and stored in the ControlPad when entering the weights into the software (manually or automatically through the balance connection). The extract percentage calculation is performed by using the following formulas:

$$\text{Extract (g)} = (\text{Total} - \text{Tare})$$

$$\text{Extract (\%)} = \frac{\text{Extract} \times 100}{(\text{Sample})}$$

Where:

Sample= sample weight (g)

Tare= weight of the empty extraction cup (g)

Total= weight of the extraction cup + extract (g)

Sample (g)	Extract (g)	Extract (%)
5,0485	0,1443	2,86%
5,0017	0,1456	2,91%
5,0295	0,1454	2,89%
5,0171	0,1461	2,91%
5,0226	0,1452	2,89%
5,0497	0,1458	2,89%
Average ± SD%		2.892 ± 0.002
RSD% *		0.678
Fat Labeled Value: 2,7 g / 100 g		

* RSD% = (Standard Deviation x 100) / Average

Conclusion

The results obtained are reliable and reproducible in accordance with the expected values, with a low relative standard deviation, that means high repeatability of the results.

Therefore, SER 158 Solvent Extractor is the ideal solution for the fat content determination in oat meal.

Benefits of hot solvent extraction (Randall) by using the **SER 158 Automatic Solvent Extractor**:

- up to 5 times faster than traditional Soxhlet (hot solvent vs. cold solvent);
- low solvent consumption (high solvent recovery, approximately 90%) - limited cost per analysis;
- no exposure to solvent thanks to **SolventXpress™**
- worldwide recognized official method;
- full traceability of data with automatic result calculation and storage on the on-board archive.