
Crude Fat Determination in Potato Chips according to the Randall method

Reference: AOAC Official Method 963.15

Tested with VELP Scientifica SER 158/6 Solvent AutoExtractor (Code F303A0380)



Introduction

Potato chips are the number one bestselling snack in the world followed by tortilla chips and crackers. They are thin slices of potato deep fried or baked until crunchy and salted. The snack food became mass-produced for home consumption in 1910, when The Potato Chip Company, began manufacturing. Nowadays potato chips include flavors such as barbecue, sour cream & onion, salt & pepper, ham and many others. The food marketing in developing and developed countries is nowadays shifting on low fat diets, since diets and activity patterns had changed drastically, increasing the obesity rate at pandemic levels (Barry M. et al., 2013). The fat content it's an important parameter to be showed in snacks labels, since the increased interest on this parameter by the consumers.

Fat Determination in Potato Chips

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

Potato chips

Fat labeled value: 28 g / 100 g

Chemicals and Equipment Required

- Analytical balance, 3 decimals
- Extraction thimbles (33x80 mm) (Code A00000295)
- Glass extraction cups
- Viton seals
- Petroleum Ether 40 – 60 °C as solvent
- Sodium sulphate anhydrous
- Defatted cotton

Sample Preparation

Fix the Extraction thimbles with the Extraction thimbles holders (Code A00000312). Grind around 20 g of potato chips and put 3 g of (*Sample*) directly in the VELP extraction thimbles using the Thimble weighing cup (Code A00000310). Add about 2 g of sodium sulphate anhydrous and mix thoroughly using a glass rod. Clean the glass rod using a piece of clean defatted cotton and place it into each thimble, over the sample. Position the extraction thimbles in the extraction cups.

Glass Extraction Cups Preparation

Position the empty extraction cups in an 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 SER 158.

Extraction Procedure with SER 158

On the ControlPad select “Analysis”, and then method “Fried potatoes” including the following parameters:

- Immersion Time: 20 minutes
- Removing Time: 8 minutes
- Washing Time: 20 minutes
- Recovery Time 10 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 Potato Chips

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

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

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

Where:

Sample = sample weight (g)

Tare = weight of the empty extraction cup (g)

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

Tare (g)	Sample (g)	Total (g)	Extract (g)	Extract (%)
122.191	2.857	123.006	0.815	28.52
123.298	3.018	124.157	0.859	28.46
122.994	2.922	123.821	0.827	28.30
123.221	2.954	124.062	0.841	28.46
123.307	2.804	124.111	0.804	28.67
124.817	2.904	125.646	0.829	28.54
			Average ± SD%	28.49 ± 0.12
			RSD% **	0.43

Fat Labeled Value: 28 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 (RSD < 1%), that means high repeatability of the results.

Therefore, SER 158 Solvent Extractor is ideal for the fat content determination in potato chips.

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

- up to 5 times faster than Soxhlet (hot solvent vs. cold solvent)
- low solvent consumption (high solvent recovery, approximately 90%) - limited cost per analysis
- no exposure to solvent
- worldwide official method
- full traceability with automatic result calculation and on-board archive