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## Fat Determination in Mayonnaise according to the Randall method

Reference: AOAC Official Method 2003.06: Crude Fat in Feeds, Cereal Grains, and Forages

Tested with VELP Scientifica SER 148/6 Solvent Extractor (Code F30300242)



## Introduction

Mayonnaise is a white or pale yellow cream used as dressing for salads, fish or meat dishes. It is a stable emulsion of vegetable oil fractionated in water, with egg yolk as an emulsifier, and flavored with vinegar or lemon juice. Commercial product has a fat content ranging between 70-80%, however an handmade mayonnaise can reach 85%. The low-fat mayonnaise contains starches, cellulose gel or other similar ingredients to simulate the texture of normal mayonnaise.

## Fat Determination in Mayonnaise

Randall method is a modification of the standard Soxhlet extraction: in Randall, the test portion is in contact with pure hot solvent, ensuring a fast solubilization with a considerable reduction of the extraction time (approx. 90 minutes).

Three extraction phases are necessary with SER 148 (see the following picture):



First, the extraction is made by immersion of the sample in the boiling solvent. This step is followed by a rinsing phase with hot solvent. Then, all the solvent evaporates and it is recovered in a condenser. The calculation of the total fat content follows gravimetrically after drying the extract.

## Sample

Mayonnaise Fat labeled value: 72 g / 100 g

## Chemicals and Equipment Required

- Gibertini analytical balance, 3 decimals
- Extraction thimbles (33x80 mm) (Code CM0111148)
- Glass extraction cups (Code A00000142)
- Viton seals (Code A00000061)
- Petroleum Ether 40 – 60°C as solvent

## Sample Preparation

### Extraction thimbles Preparation

Mix around 20 g of mayonnaise in an empty and clean beaker. Put 1 g of sample ( $M_{sample}$ ) in each of the 6 thimbles, using the Thimble weighing cup (Code A00001146). Fix every thimble with one magnetic Extractions thimbles holders (Code A00001142): it is necessary to transfer directly the sample to SER 148.

### Glass Extraction Cups Preparation

Keep the empty glass extraction cups in an oven (105 °C for 1 hour). Cool them in a desiccator till constant weight of the tare ( $M_{tare}$ ).

## Extraction Procedure with SER 148

Before starting the extraction. Select one of the programs (1-29) and set the following parameters:

- Temperature: 110 °C
- Immersion Time: 30 minutes
- Washing Time: 60 minutes
- Recovery Time 20 minutes

Introduce the glass cups containing the solvent (Petroleum Ether, 60 ml) in the extraction equipment.

Close the extraction unit, and press START button to activate the cooling water flow and the heating.

Immerse the thimbles into the boiling solvent by placing the slider into “Immersion” position.

After 30 minutes press ENTER and extract the thimbles out of solvent, by placing the slider into “Washing”.

After 60 minutes of reflux washing press ENTER and close the knob, let the solvent evaporate and recover it by condensation.

- To reduce the recovery time, turn on the air pump pressing AIR.
- Prevent the complete solvent evaporation (few ml are required).

Dry the cups in an oven (1 hour at 105 °C); then, let them cool to room temperature in a dessiccator and record the accurate weight ( $M_{tot}$ ).

### Typical Results on Mayonnaise

The results are gravimetrically determined, by using the formula:

$$\text{Fat \%} = (M_{tot} - M_{tare}) \times 100 / (M_{sample})$$

Where:

$M_{sample}$  = sample weight (g)

$M_{tare}$  = weight of the empty cup (g)

$M_{tot}$  = weight of the cup containing the fat residues (g)

$M_{tare}$	$M_{tot}$	Fat	$M_{sample}$	Fat%
71.710	72.444	0.734	1.007	72.890
72.660	73.380	0.720	1.005	71.642
76.969	77.721	0.752	1.047	71.824
73.590	74.340	0.750	1.028	72.957
77.936	78.669	0.733	1.028	71.373
77.750	78.489	0.739	1.027	71.957
			<b>Average ± SD%</b>	<b>72.107 ± 0.662</b>
			<b>RSD% *</b>	<b>0.919</b>

Fat Labeled Value: 72 g/ 100 g

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

### Conclusion

The obtained results 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.

SER 148 Solvent Extractor is ideal for the fat content determination in mayonnaise.

Benefits of Randall method by using SER 148 are:

- up to 5 times faster than Soxhlet (hot solvent vs. cold solvent)
- low solvent consumption (high solvent recovery) - limited cost per analysis
- full operator safety in compliance with IP55
- worldwide official method