
Crude Fat Determination in Tomato Sauce according to the Randall method

Reference: AOAC Official Method 920.172

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



Introduction

Tomato sauce refers to any of a very large number of sauces made primarily from tomatoes, usually to be served as part of a dish (rather than as a condiment). Tomato sauces are common for meat and vegetables, but they are perhaps best known as sauces for pasta dishes.

Generally this sauce have a very low quantity of fat, for sauces produced industrially is around 2-5%.

Fat Determination in Tomato Sauce

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

Datterini Sauce

Fat range value: 3.0-3.5 g / 100 g

Chemicals and Equipment Required

- Analytical balance, 3 decimals
- Extraction thimbles (33x80 mm) (Code A00000295)
- Glass extraction cups Ø 56x120mm (Code A00000290)
- Vaflon seals (Code A00000288)
- Diethyl ether as solvent
- Sodium sulphate anhydrous
- Defatted cotton
- Homogenizer OV5 (Code R20900010)

Sample Preparation (*)

Fix the Extraction thimbles with the Extraction thimbles holders (Code A00000312). Homogenize through VELP OV5 around 40 g of tomato sauce in an empty and clean beaker. Then, put 5 g of sample in another clean beaker, add about 15 g of sodium sulphate anhydrous and mix with a spatula in order to dry well the tomato sauce. Put the dry sample in the VELP extraction thimbles with a spatula. Clean the beaker and the spatula using a 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.

(*)Alternatively, is possible to put 5 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.

Extraction Procedure with SER 158

On the ControlPad select “Analysis”, and create a new customer method “Tomato sauce” setting the following parameters:

- Immersion Time: 30 minutes
- Removing Time: 10 minutes
- Washing Time: 120 minutes
- Recovery Time 20 minutes
- Cooling Time: 20 minutes
- Extraction cups: standard Ø 56x120mm
- Thimble: 33x80 mm
- Solvent: Diethyl Ether, 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 Tomato Sauce

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 (%)
132,6542	5,0731	132,8209	0,1667	3,29%
133,7673	5,0742	133,9312	0,1639	3,23%
131,5628	5,0718	131,7286	0,1658	3,27%
132,6083	5,0361	132,7709	0,1626	3,23%
132,4191	5,0527	132,5826	0,1635	3,24%
137,8848	5,0857	138,0500	0,1652	3,25%
			Average ± SD%	3,25 ± 0,02%
			RSD% **	0,716%

Fat Labeled Value: 3.0-3.5 g / 100 g

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



CRUDE FAT DETERMINATION IN TOMATO SAUCE RANDALL METHOD

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 tomato sauce.

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