

N/Protein Determination in Yogurt according to the Dumas combustion method

Reference: **UNI EN ISO 14891**, **FIL-IDF 185**, 2002 "Milk and milk products - Determination of nitrogen content - Routine method using combustion according to the Dumas principle"

Tested with **VELP Scientifica NDA 701 Dumas Nitrogen Analyzer** (Code F30800070)



Introduction

Among dairy foods, yogurt is one of the most popular and consumed product in the world. Its composition is peculiar: in fact, it's nutritionally rich in protein, calcium, riboflavin, vitamin B6 and vitamin B12. The bacterial strains used to produce yogurt from milk, induce a particular fermentative process in which the lactose is converted to glucose and galactose, and partially fermented to lactic acid. All this makes it more digestible for lactose-intolerant individuals.

Furthermore, the fermentation determines the formation of particular compounds responsible the sensory profile of the product: for this reason, it becomes important to know the amount of key nutrients of milk and of the finished product, such as proteins.

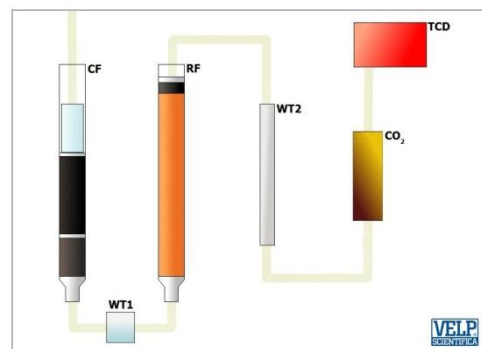
Protein Determination in Plain Yogurt

The Dumas method starts with a combustion furnace (CF) to burn the sample, obtaining elemental compounds.

Water is removed by a first physical trap (WT1 - **DriStep™**), placed after the combustion, and a second chemical one (WT2). Between the two, the elemental substances passed through a reduction furnace (RF).

The auto-regenerative CO₂ adsorbers (CO₂) let pass only the elemental nitrogen that is detected by the **LoGas™** innovative Thermal Conductivity Detector (TCD) with no requirement for a reference gas.

The NDA 701 is controlled via PC through the intuitive **DUMASoft™**.



NDA 701 Preliminary Operations (daily)

Follow the operating manual to start the NDA 701 and check that the following parameters are set:

Temperature Combustion reactor (Code A00000158): 1030 °C

Temperature Reduction reactor (Code A00000226): 650 °C

Flow rate MFC1 He: 195 ml/min

Flow rate MFC2 He: 200 ml/min

Condition the system by testing 2 EDTA standard (Code A00000149) and 3 to 5 empty tin foils (Code A00000153) as Check up.

Verify the calibration curve with one or more tests as Standard by testing the same standard used for the curve creation.

Sample Preparation

Use the tin foil cup closing device (Code A00000217) to create the right shape of the tin foil cup, in order to make the operation of sampling easy: weigh the sample (90 - 120 mg) directly in the tin foil, place it on the balance, using a spatula and then close the tin foil, obtaining a capsule.

Plain yogurt doesn't need to be homogenized.

Load the capsule into the autosampler.

Analysis Procedure

Fill the following fields in the database: **Sample name, Weight, Method, Sample type, Calibration number**

The dedicated method "YOGURT" shows the following parameters:

Protein factor: 6.38

O₂ flow rate: 400 ml/min

O₂ factor: 1.4 ml/mg

Press  to start the analysis.

Analysis time: from 3 minutes for one run.

Typical Results on Plain Yogurt

Sample quantity (mg)	Nitrogen %	Protein %
115.50	0.773	4.933
118.60	0.772	4.928
104.80	0.775	4.945
101.80	0.772	4.924
110.10	0.779	4.968
95.90	0.779	4.970
92.80	0.768	4.900
92.40	0.781	4.982
97.40	0.776	4.953
102.70	0.787	5.020
Average ± SD%	0.776 ± 0.005	4.952 ± 0.034
RSD% *	0.695	0.695

Protein Labeled Value: 5.0%

Protein Factor: 6.38

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

Conclusion

The obtained results are reliable and in accordance with the labeled value.

Results have been obtained with the following calibration curve: in a range of 0,1587 - 2,2066 mg N with 5 measurements (from 11,5 to 159,9 mg) of rice flour standard (%N = 1,38 ± 0,05) (Code A00000235).

Benefits of Dumas combustion method are:

- High productivity, non-stop performance
- Time saving, few minutes required
- Moderate running costs
- Totally unsupervised, fully automated
- Omission of harsh and toxic chemicals
- Eco-friendly, low amount of residues and wastes

Several organizations working with standardization and recommendation of chemical methods have approved combustion methods for the determination of nitrogen.

Thanks to development in sophisticated instrumentation, the Dumas principle, became a practical alternative for the determination of nitrogen in milk products.