APPLICATION NOTE

F&F-D-005-2013/A1

N/Protein Determination in Pasta

according to the Dumas combustion method

Reference: **AOAC 992.23** Crude Protein in Cereal Grains and Oilseeds; **AACC 46-30** Crude Protein Combustion Method; **ICC 167** Determination of crude protein in grain and grain products for food and feed by the Dumas Combustion Principle

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

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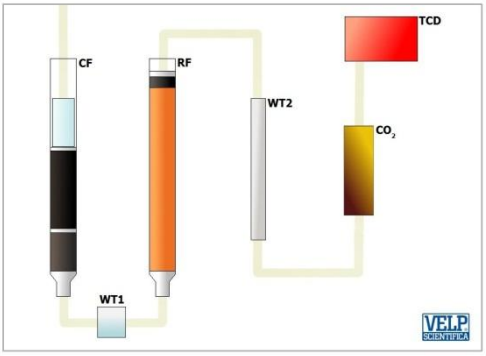
N/PROTEIN DETERMINATION IN PASTA
DUMAS COMBUSTION METHOD

Introduction

Dried and fresh pasta are traditional Italian products, known all over the world in a number of shapes and varieties, as shown by the 310 specific forms and by over 1300 names having been recently documented.

Basic pasta dough has always been made mostly of durum wheat flour or semolina; other grains can be used, including those from barley, buckwheat, rye, rice and maize, as well as chestnut and chickpea flours. In order to meet the demands of both health conscious and coeliac sufferers, the use of rice, maize and whole durum wheat has become commercially significant.
It's always more important to know the ingredients and amount of all the components, as proteins, for different reasons, including legal and nutritional purposes (labeling).

Protein Determination in Pasta



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 CO_2 adsorbers (CO_2) 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

Collect 100 g of pasta for soup from durum wheat flour, into a beaker and mix it with a spoon by hand.
Grind finely it using a grinder to suitable fineness to obtain ≤ 2,0 % relative standard deviation (RSD) for 10 successive nitrogen determinations.
Using a spatula, put ~ 100 mg of sample directly into the tin foil.
Close the tin foil, obtaining a capsule.
Load the capsule into the autosampler.

Analysis Procedure

Fill the following fields in the database: **Sample name, Weight, Method, Sample type, Calibration number**
The PASTA method shows the following parameters:
Protein factor: 6.25
O_2 flow rate: 400 ml/min
O_2 factor: 1.5 ml/mg
Press to start the analysis.
Analysis time: from 3 minutes for one run.

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Typical Results on Dried Pasta

Sample quantity (mg)	Nitrogen %	Protein %
96.60	1.968	12.300
102.50	1.954	12.213
99.80	1.967	12.294
99.50	1.966	12.288
96.50	1.965	12.281
100.20	1.970	12.313
97.70	1.945	12.156
104.30	1.963	12.269
104.10	1.947	12.169
95.50	1.969	12.306
Average ± SD%	**1.961 ± 0.009**	**12.259 ± 0.058**
RSD% *	**0.473**	**0.469**
Protein Labeled Value: 12.0%		
Protein Factor: 6.25**		

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

** Generally 6,25 is the protein factor for nutritional table of pasta, but also 5,70 can be used.

Conclusion

The obtained results are reliable and in accordance with the labeled value.
The combustion method, relying on the Dumas principle, for the determination of total nitrogen in cereals, has been included as an official alternative to the Kjeldahl method.

Results have been obtained with the following calibration curve: in a range of 0 - 2.76 mg N with 5 measurements (from 30 to 200 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

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