N/Protein Determination in Oat Meal

according to the Dumas method (He/Ar as Carrier)

Reference: **AOAC 992.23** Crude Protein in Cereal Grains and Oil seeds

Tested with **VELP Scientifica NDA 702 Dual Carrier Gas Dumas Nitrogen Analyzer** (Code F30800080)

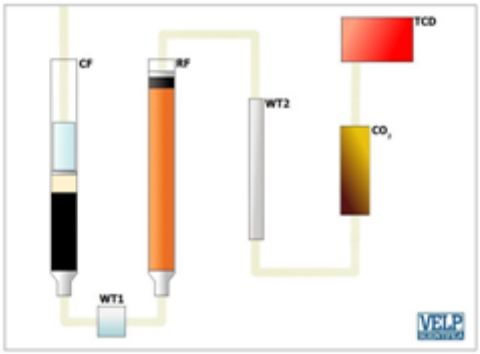
N/PROTEIN DETERMINATION IN OAT MEAL

DUMAS COMBUSTION METHOD

Introduction

The oat (*Avena sativa*), sometimes called the common oat, is a species of cereal grain grown for its seed, which is known by the same name (usually in the plural, unlike other cereals and pseudocereals). While oats are suitable for human consumption as oatmeal and rolled oats, one of the most common uses is as livestock feed. The established property of their cholesterol-lowering effects has led to acceptance of oats as a health food.
Oats are also occasionally used in several different drinks as for example, beers or “avena” a drink from Latin America. Oat extracts can also be used in cosmetics also oat grass has been used traditionally for medicinal purposes, including to help balance the menstrual cycle, treat dysmenorrhoea and for osteoporosis and urinary tract infections.

Protein Determination in Oat Meal



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 702 is controlled via PC through the intuitive **DUMASoft™**.

NDA 702 Preliminary Operations (daily)

Follow the operating manual to start the NDA 702 and check that the following parameters are set:
Temperature Combustion reactor (Code A00000158): 1.030 °C
Temperature Reduction reactor (Code A00000226): 650 °C
Flow rate MFC1 (He/Ar): 190 ml/min
Flow rate MFC2 (He/Ar): 220 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

Oat Meal Reference Material code A00000318 Expected Nitrogen range: 1,9 ± 0,3 %

Grind the test samples using a grinder to suitable fineness (particle size ≤ 0.5 mm) to obtain ≤ 2,0 % relative standard deviation (RSD) for 10 successive nitrogen determinations.
Weigh around 150 mg of the homogeneous sample directly into the tin foil directly on the balance.
Close the tin foil, obtaining a capsule and load the capsule into the autosampler.

Analysis Procedure

Fill the following fields in the database: **Sample name, Weight, Method, Sample type, Calibration number**
The CEREAL MEAL 4 method shows the following parameters:
Protein factor: 5.83
O_2 flow rate: 400 ml/min
O_2 factor: 1.6 ml/mg
Press to start the analysis.
Analysis time: from 3 minutes for one run.

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Typical Results on Oat Meal

Results have been obtained with the following calibration curve: in a range of 0 – 8,0 mg N with 7 measurements of EDTA standard (N% = 9.57) (Code A00000149) for both carrier gas.
The data obtained are included in the tolerance admitted by the EDTA certificate.

HELIUM as Carrier Gas		ARGON as Carrier Gas	
Sample quantity (mg)	**Nitrogen %**	**Sample quantity (mg)**	**Nitrogen %**
149.30	2.008	149.30	1.985
149.30	2.014	150.00	2.014
151.40	1.983	151.50	1.990
150.60	1.986	154.50	1.997
148.90	2.006	151.30	2.004
151.20	1.987	148.70	1.984
150.90	1.993	150.50	1.974
149.60	2.007	149.40	1.965
149.00	2.001	149.70	1.964
146.80	1.992	150.10	1.978
Average ± SD	**1.998± 0.011**		**1.986 ± 0.016**
RSD% *	**0.543**		**0.819**
Nitrogen Expected Value: 1.9 ± 0,3 %			

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

Conclusion

Results are extremely reliable and reproducible as demonstrated by the RSD with the same conditions (method and sample weight) since the goal is to obtain < 2.0 % relative standard deviation - as requested by official methods.

Helium remains the best choice for premium accuracy but its shortages and interruptions are affecting any related product or instrument, including elemental analyzers. Argon, the best alternative available, has demonstrated to be a valid substitute, ensuring optimal results. VELP Scientifica **NDA 702** Dual Carrier Gas Dumas Nitrogen Analyzer is the perfect response to simple, fast and precise nitrogen/protein determination, both with Helium and Argon as carrier gas.