
N/Protein Determination in Pumpkin Seed 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)

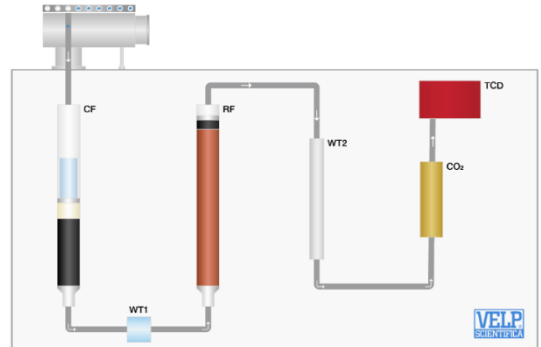


Introduction

Pumpkin seeds are nutrient-rich, with especially high content of protein, dietary fiber and numerous micronutrients. The seeds have long been valued as a source of the mineral zinc, and the World Health Organization recommends their consumption as a good way of obtaining this nutrient. Pumpkin seeds are a common ingredient in Mexican cuisine and they are typically rather flat and asymmetrically oval, and light green in color and may have a white outer hull. The oil of pumpkin seeds, a culinary specialty and important export commodity of Central Europe, is used in cuisine as a salad and cooking oil.

Protein Determination in Pumpkin seed

The Dumas method starts with a combustion furnace (CF), obtaining a mixture of gas molecules-
 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 adsorbents 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

Pumpkin seed	Expected Protein range: 28-30 %
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Remove the peel of the seed, if necessary.

Grind the test samples using a grinder to suitable fineness (particle size ≤ 0.5 mm) to obtain $\leq 2,0$ % relative standard deviation (RSD) for 10 successive nitrogen determinations.

Weigh around 100 mg of the homogeneous sample directly into the tin foil directly on the balance.

Close the tin foil, obtaining a capsule and load it into the autosampler.

Analysis Procedure

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

The PUMPKIN SEED method shows the following parameters:

Protein factor: 6.25

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.

Results on Pumpkin seed

Results have been obtained with the following calibration curve: in a range of 0 – 10 mg N with 5 measurements of EDTA standard (N% = 9.57) (Code A00000149) for both carrier gases.

The data obtained are included in the tolerance admitted by the EDTA certificate.

The accuracy of NDA 702 has been demonstrated through 10 successive analysis of nicotinic acid as indicated in the official method AOAC 992.23.

HELIUM as Carrier Gas		ARGON as Carrier Gas	
Sample quantity (mg)	Protein %	Sample quantity (mg)	Protein %
99.76	28.812	100.11	28.844
99.96	29.003	99.98	29.226
99.90	28.826	99.92	28.397
100.01	29.165	99.84	28.847
100.05	28.611	99.86	28.714
100.14	28.908	103.60	28.432
100.17	28.959	101.50	28.724
100.06	28.833	98.90	29.345
100.12	28.806	100.80	28.834
100.05	28.338	102.00	29.147
Average ± SD	28.826± 0.225	Average ± SD	28.851 ± 0.314
RSD% *	0.781	RSD% *	1.089

Protein Expected Value: 28 -30 %

Protein Factor: 6.25

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

Conclusion

Results are extremely reliable, as demonstrated by the RSD, both using helium and argon as carrier gas, 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.

Benefit of N/Protein determination with VELP Elementar Analyzer NDA 702 are:

- Excellent accuracy and precision
- Low cost per analysis
- Fast and easy to use Analyzer
- Cloud connection to VELP Ermes to access the data and the instrument in real time, everywhere.