

Nitrogen/Protein determination in Flours using the Thermo Scientific FLASH 4000 Series

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Introduction

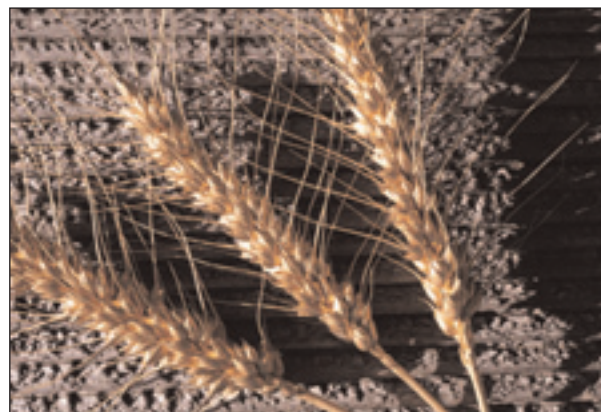


Cereal grains (commonly wheat, rye, barley, rice and corn) and other edible plant matter that contain starch as polysaccharides and proteins are ground into fine powders to form flours. Ground legumes and nuts, such as soy are also called flours. Flour is the key ingredient to breads, pastas, noodles and pastries; staple foods in many countries, resulting in high demand worldwide.

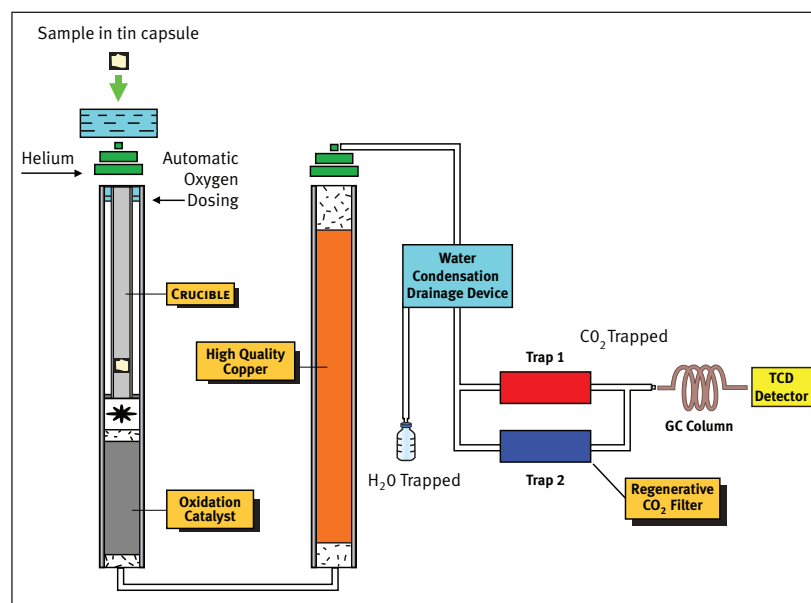
This method guide demonstrates the analysis of wheat, corn, rice and soy flours using the Thermo Scientific FLASH 4000 Series N/Protein Analyzer. Wheat flour is the key ingredient to the variety of breads, pastas and pastries in Europe and the United States. Rice flour is

used throughout Southeast Asia to make fresh rice noodles and sweets. Soy flour, commonly used in China, is extremely rich in high quality protein and low in saturated fats and is cholesterol free.

Regulations in many countries require specific controls of the quality of flour. An important parameter is the Protein content and the monitoring of its amount, through the determination of Nitrogen, must be accurate to identify the nutritional quality of these products. The FLASH 4000 N/Protein Analyzer, based on the dynamic flash combustion of the sample, copes effortlessly with the wide array of laboratory requirements such as accuracy, day-to-day reproducibility and high sample throughput.



Analytical Configuration



Analytical conditions

Temperature left reactor: 950 °C
Temperature right reactor: 840 °C
Temperature oven: 50 °C

Carrier Flow (He): 300 ml/min
Reference Flow (He): 300 ml/min

Standard: 500 mg EDTA (9.59 %N)

Sample weight: 500 mg - 1.8 g

Note: The Oxygen amount necessary for the complete combustion of samples is calculated automatically by the OxyTune® function present in the Eager Xperience dedicated software.

Key Words

- Flash Combustion
- Flour
- Food Safety
- Nitrogen
- Protein

Results

Different flours were chosen to validate the system. The Protein content is calculated automatically by the Thermo Scientific Eager Xperience Software using the default Protein factor 6.25. The Protein factor can be changed in accordance with the food type.

Table 1 shows the Nitrogen and Protein determination in wheat, corn, rice and soy flours. Each sample was analyzed 10 times to show the reproducibility obtained, using a weight of around 1000 mg.

Table 1 – N/Protein determination in wheat, corn, rice and soy flour

Wheat flour			Corn flour			Rice flour			Soy flour		
Weight (mg)	N %	Protein %	Weight (mg)	N %	Protein %	Weight (mg)	N %	Protein %	Weight (mg)	N %	Protein %
1002.8	1.8105	11.3154	1001.4	1.2631	7.8948	994.7	1.5285	9.5534	996.6	5.4271	33.9195
1010.2	1.8347	11.4672	996.7	1.2768	7.9801	988.2	1.5330	9.5814	997.0	5.4250	33.9065
999.6	1.8097	11.3106	1009.6	1.2582	7.8635	994.9	1.5386	9.6166	1007.3	5.4662	34.1637
1001.8	1.8269	11.4180	997.7	1.2483	7.8018	993.1	1.5392	9.6197	1017.0	5.4355	33.9719
997.9	1.7983	11.2391	1013.3	1.2629	7.8932	999.4	1.5510	9.6936	999.4	5.4500	34.0628
999.7	1.8190	11.3689	1008.7	1.2714	7.9460	1009.5	1.5397	9.6234	1008.6	5.4407	34.0045
1009.7	1.8102	11.3139	981.0	1.2651	7.9070	1003.5	1.5419	9.6370	989.2	5.4854	34.2835
1008.4	1.8246	11.4037	997.4	1.2663	7.9148	1011.7	1.5496	9.6851	993.3	5.4748	34.2173
1008.2	1.8220	11.3874	1002.8	1.2633	7.8960	1003.6	1.5485	9.6781	1024.8	5.4649	34.1557
991.8	1.8088	11.3048	991.4	1.2542	7.8388	1008.2	1.5381	9.6129	1002.7	5.4784	34.2402

Table 2 compares the Nitrogen and Protein content between the different types of flours. The data are the average of the determinations shown in Table 1 and the relative standard deviation of less than 1 % demonstrates excellent reproducibility. The difference in Protein levels illustrates how the properties of these flours vary.

Table 2 – N/Protein comparison

Type of flour	Average N%	Average Protein %	RSD %
Wheat flour	1.8165	11.3529	0.5967
Corn flour	1.2630	7.8936	0.6431
Rice flour	1.5408	9.6301	0.4682
Soy flour	5.4548	34.0925	0.4039

Table 3 shows the Nitrogen and Protein data obtained when changing the weight of the same wheat flour sample. Excellent reproducibility was obtained in the range 500 mg to 1.7 g. The sample was analyzed in triplicate for each range using the same analytical conditions. No memory effect was observed when changing sample weight.

Table 3 – N/Protein determination of wheat flour

Weight (mg)	N %	Protein %	Av. N %	Av. Prot %	RSD %
508.4	1.8808	11.7552	1.8746	11.7163	0.4197
492.1	1.8772	11.7327			
512.8	1.8657	11.6610			
687.7	1.8356	11.4729	1.8402	11.5012	0.6935
699.9	1.8303	11.4396			
700.3	1.8546	11.5913			
1309.9	1.8675	11.6722	1.8545	11.5904	0.6329
1306.3	1.8449	11.5304			
1294.5	1.8509	11.5686			
1709.4	1.8607	11.6294	1.8765	11.7280	0.7590
1694.8	1.8803	11.7519			
1700.1	1.8884	11.8028			

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