



Application Note

No. 804/2023

Determination of Quality Parameters in Flour

ProxiMate™ UpView and NIRFlex N-500:

Determination of Moisture, Protein, Dry Gluten, Wet Gluten, and Ash with NIR



1. Introduction

NIR is a multifaceted technique that can be applied at any stage of the production process, be it at the raw material intake, the production itself, or the final quality control. Typical quality indicators of wheat flour, such as moisture, protein, gluten and ash can be determined in only a few seconds without any prolonged sample preparation.

As a secondary technique, the measurement itself stands and falls with the chemometric calibration. BUCHI pre-calibrated applications can be used as is or further customized to meet individual needs.

Below, this concept is proven using the pre-calibrated Wheat Flour application to analyze two wheat flour samples provided by a supplier of reference materials.

2. Equipment

- ProxiMate™ UpView with Pre-Calibrated Application Wheat Flour Upview
- NIRFlex N-500 Solids with Pre-Calibrated Application Wheat Flour
- High-Quality Petri Dish as Sample Cups

3. Pre-Calibrated NIR Applications for Wheat Flour

The Wheat Flour pre-calibrated applications can be used for the following flour types:

- Soft Wheat
- Hard Wheat
- Durum Wheat
- Semolina

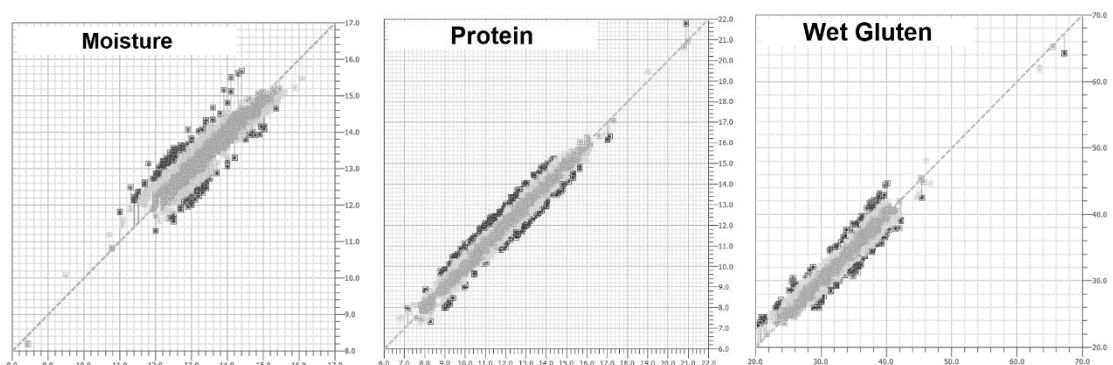
3.1 Wheat Flour Upview Pre-Calibrated Application for ProxiMate™

The pre-calibrated application for ProxiMate™ contains the parameters moisture, protein, and wet gluten. Smaller data sets for baking absorption and falling number are available as starter calibrations.

Calibrations for other parameters, such as ash or starch, can easily be created with the AutoCal function of ProxiMate™. Especially for ash, the optional visible range of ProxiMate™ is beneficial.

Table 1: Parameters, Ranges, and R2 values for the Wheat Flour Upview Application

Parameter	Min	Max	R2
Moisture	8.43	16.09	0.82
Protein	6.72	20.98	0.94
Wet Gluten	20.35	67.25	0.93



Picture 1: Predicted vs. reference values for moisture (left), protein (middle), and wet gluten (right)

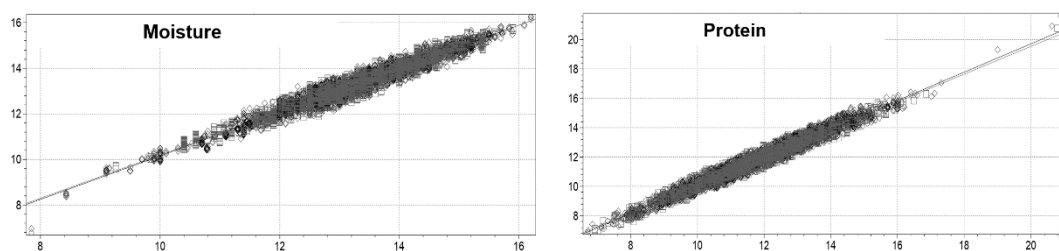
3.2 Wheat Flour Pre-Calibrated Application for NIRFlex N-500

The pre-calibrated application for N-500 contains the parameters moisture, protein, dry gluten and ash. Smaller data sets for wet gluten, baking absorption, falling number, ash, and starch are available as starter calibrations.

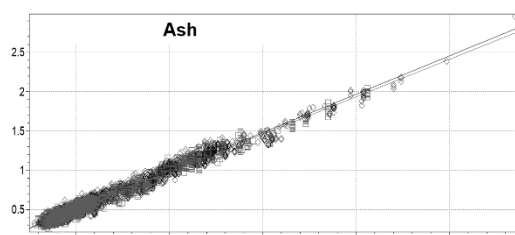
It is also possible to determine rheological parameters, such as W, L, P, degree of softening, dough development time, granularity, or sedimentation, with NIR.

Table 2: Parameters, Ranges, and R2 values for the Wheat Flour Application

Parameter	Min	Max	R2
Moisture	7.9	16.20	0.95
Protein	6.70	28.00	0.96
Dry Gluten	9.16	12.00	0.78
Ash	0.28	2.85	0.97



Picture 2: Predicted vs. reference values for moisture (left) and protein (right)



Picture 3: Predicted vs. reference values for ash

4. Measurements and Results

Two reference samples were received. They were filled into high-quality glass petri dishes and measured as is.

Table 3: Measurement results NIR compared to reference values for Sample 1

Parameter	Prediction ProxiMate™ (%)	Prediction N-500 (%)	Reference Value (%)
Moisture	15.38	14.18	14.61
Protein	9.98	11.27	10.72
Wet Gluten	25.74	-	25.7
Dry Gluten	-	9.94	8.9
Ash	-	0.58	0.64

Table 4: Measurement results NIR compared to reference values for Sample 2

Parameter	Prediction ProxiMate™ (%)	Prediction N-500 (%)	Reference Value (%)
Moisture	15.14	13.92	14.32
Protein	11.41	12.95	12.81
Wet Gluten	30.39	-	30.8
Dry Gluten	-	10.02	11.2
Ash	-	0.57	0.58

5. Conclusion

The Wheat Flour pre-calibrated applications can be readily applied to measure the wheat flour reference samples with deviations to the reference values of essentially less than 1%. Together with the ProxiMate™ or the NIRFlex N-500, the applications will ease and speed up analyses of flour samples from day one.

Please also check our application finder for more info: [NIR Applications Finder \(buchi.com\)](https://www.buchi.com/nir-applications-finder)

In addition to the pre-calibrated applications, it is always possible to extend smaller datasets and create new calibrations with AutoCal and the support from the BUCHI team.