



FT-NIR Spectroscopy for Forage Analysis

Application Note N304

For optimal ration balancing, analysis of the compositions of forages like fermented silage and dried feedstocks like hay is critical. The speed of wet forage analysis gains additional importance during harvest when faster screening is required for a higher number of samples. FT-NIR allows direct testing of multiple components within seconds for both fresh and dried samples.

FT-NIR spectroscopy is a well-established technique for feed analysis because it provides the nutritional composition accurately, cost-effectively and rapidly with a single measurement. Both economical and environmentally friendly, the analysis requires no chemicals for the analysis, and creates no waste.

In feed analysis, wet silages, specifically, can be tricky to analyze because of their inhomogeneity. The MPA II with the extra-large rotating sample cup IN313-S provides a simple solution without sample preparation. With this cup, the measured sample area is 100 times the area of a static sample, enabling an efficient analysis of inhomogeneous samples with only one filling. For bulky samples like hay or straw, an additional compacting ring can be added.

For dry and ground forage samples, a TANGO-R or MPA II with a standard 50 or 97 mm cup is used. A 97 mm cup with approximately five fillings can also be used for wet forages as an alternative to the extra-large cup with similar results.

In combination with Bruker's portfolio of comprehensive accessories, the FT-NIR spectrometers MPA II and TANGO cover all requirements for the analysis of all types of wet and dry forage. The composition of further feed ingredients such as cereals, oilseeds, or by-products like expeller or meals is also accessible with the same devices.

What parameters can be evaluated?

- Dry matter
- Fat
- Protein
- Crude fiber
- NDF
- ADF
- Ash
- Starch
- Lactic acid
- Volatile fatty acids
- Digestibility

Measurement of corn silage: MPA II equipped with the extra-large rotating sample cup IN313-S (370 mm diameter).



What Samples can be Analyzed?

- Wet fresh forages (e.g., fresh grass)
- Dry roughages (e.g., hay, straw)
- Fermented forages (e.g., corn silage, grass silage)
- Total mix ratios

Fresh or Dry Forage Analysis?

With such instrumental flexibility, the decision whether to analyze wet fresh or dry forage is completely up to the needs and priorities of the customer.

Advantages of Fresh Forage Analysis:

- Minimal sample preparation
- Faster turnaround time
- Analysis of volatile components which would be lost when dried (ammonia, volatile fatty acids, etc.)
- Fewer chemical changes in the sample (Maillard reaction between proteins and sugars, for example)

Advantages of Dried Forage Analysis:

- Better homogeneity due to drying and grinding
- Easier sample handling
- Higher sample stability
- More accurate results

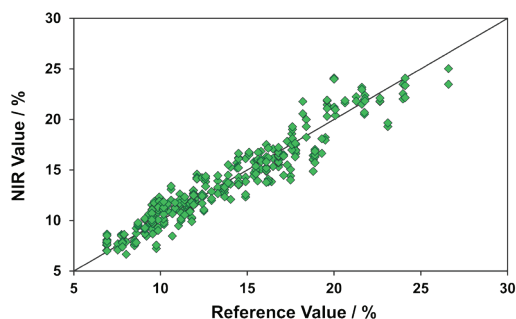


Expect High Standards:

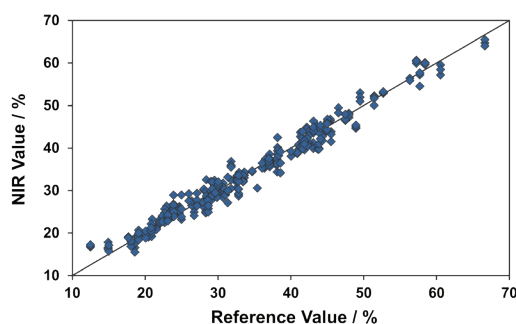
All forage calibration models offered by Bruker Optics are developed and validated according to ISO 12099 recommendations.

Calibration Models:

Protein in Fresh (Wet) Grass Silage



Dry Matter in Fresh (Wet) Grass Silage



Calibration models shown here display results for wet forage samples. Depending on sample preparation, increased accuracy can be expected for dried sample types.

FT-NIR Spectrometers: Bruker Optics offers various FT-NIR spectrometer models for lab, at-line and on-line applications:

TANGO	MPA II	MATRIX-F II
		
FT-NIR analyzer for routine use in the lab	Multi Purpose Analyzer for maximum flexibility	Process monitoring with probes and sensor heads

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**Bruker Optics is ISO 9001, ISO 13485,
ISO 14001 and ISO 50001 certified.**

