

BEST PRACTICES FOR FORAGE TESTING

By the Mycogen Seeds Dairy Nutrition Team



HIGHLIGHTS

“Wet chemistry” refers to *in-vitro* lab methodology and is more accurate than near infrared (NIR) spectroscopy for determining Neutral Detergent Fiber digestibility (NDFD).

For best results, NDFD of BMR corn silage should be measured by using *in-vitro* and not NIR.

Use the same time points when comparing NDFD test results.

Always use the same lab for testing, and don't compare results between labs.

Neutral Detergent Fiber digestibility (NDFD) is a great tool to compare the quality of forages within a forage class. Research has shown that cows can consume forages with higher NDFD at a higher amount than forages with lower digestibility. Michigan State University researchers reported that for every 1 percent increase in NDFD, cows will eat approximately 0.3-pound more dry matter, which results in about a 0.55-pound increase in milk production per cow per day! So, for example, forage at 65 percent NDFD would be expected to support 5 more pounds of milk production as compared with a forage at 55 percent NDFD. The NDFD of forage is very important, and it is crucial to understand how it is measured in the lab.

Commercial labs routinely use one of two methods to measure NDFD: *in-vitro* or near infrared (NIR) spectroscopy

In-vitro measurement is a direct measurement using chemicals in the lab and is sometimes referred to as “wet chemistry.”

NIR measurement is an estimate of NDFD made by bouncing infrared light off a forage sample by using an NIR machine. Results are based on calibration equations.

Some labs report NIR results as wet chemistry because NIR is calibrated based on *in-vitro* results. Use care to determine if the lab results are truly wet chemistry. It is generally accepted that *in-vitro* (wet chemistry) is a more accurate lab method to determine NDFD than NIR.

For best results, test brown midrib (BMR) corn silage hybrids by using *in-vitro* lab measurements for NDFD. Our experience has shown that when BMR NDFD is measured using NIR, lower values are reported and may not accurately reflect the true NDFD found in BMR corn silage hybrids.

NDFD values are being reported at different time points representing how long the forage has been incubated in rumen fluid to determine digestibility. Standards have been accepted at 30 hours or 48 hours. Thirty hours is the average time that forage remains in a high-producing cow's rumen. It is not uncommon to see other time points, such as 12 or 24 hours.

Be aware that different labs have slightly different methodologies to determine NDFD — even all the labs that use *in-vitro*. There is always inherent lab variation between labs because of the different way the labs handle samples, reagents used, etc. Avoid comparing results between labs. Pick one lab for consistency.



GLOSSARY OF FORAGE TERMS

ADF (acid detergent fiber)

Fraction of a feedstuff not soluble by acid detergent. It is roughly comparable to crude fiber plus lignin. Used to estimate the digestibility of a forage.

BMR (brown midrib)

Corn silage with a reddish-brown pigment of the leaf midrib. The BMR mutation prevents the development of lignin. BMR hybrids can contain up to 35 percent less lignin than conventional hybrids.

DIP (degradable intake protein)

Part of protein that is degradable in the rumen. Usually expressed as a percent of crude protein.

iNDF (indigestible Neutral Detergent Fiber)

Method of measuring the indigestible fiber in feedstuffs.

In situ

Way to estimate starch or fiber degradation in the rumen. Silage samples are minimally processed and placed in polyester bags and incubated in the rumen for a specified time, usually ranging from 16 to 48 hours.

In-vitro (in glass)

A laboratory method using rumen fluids to measure digestibility. Predominantly used to measure Neutral Detergent Fiber digestibility (NDFD).

Kernel milkline

The boundary line between the “milky” white fluid and where starch is accumulating in the developing kernel. It indicates the relative progression toward physiological maturity, which ultimately occurs at blacklayer formation. The milkline can help estimate whole-plant moisture content in corn silage.

Leafy

Corn silage, such as TMF hybrids, that offer more tons per acre, improved cell wall digestibility, higher dry matter intake and more energy for higher milk and beef production.

Lignin

The portion of the fiber that is indigestible. The more lignin a plant contains, the less digestible it is, resulting in less milk production.

Milk per acre

This can be figured after milk per ton is determined, if yield data is available. It is a measurement of efficiency, not profitability. Milk per acre is: Milk per ton X DM yield per acre = milk per acre.

Milk per ton

Determined after chemical analysis of silage occurs. Consists of measuring eight key factors: kernel processing, dry matter, crude protein, NDF, *in-vitro* NDF digestibility, starch percent, minerals and fat.

NDF (Neutral Detergent Fiber)

Fiber portion of the feed that influences intake and performance.

NIR NDFD (near infrared spectroscopy Neutral Detergent Fiber digestibility)

Estimated measurement of NDF digestibility based on previous wet chemistry analysis. This test is only as good as its database (number and range of samples tested). The larger the database, the more accurate it is. In general, having more than 1,000 observations per component being estimated (NDFD) is necessary to predict an accurate result.

RFQ (relative forage quality)

Uses crude protein, ADF, NDF, ash and fiber digestibility to determine the total digestible nutrient value of the forage.

RFV (relative feed value)

This index uses NDF and ADF measurements to determine quality. This formula does not measure differences in forage digestibility. It was designed to aid forage buyers in determining a price for forage.

UIP (undegraded intake protein)

Part of protein that bypasses the rumen and is digested in the cow's true stomach. Can be shown as crude protein or pounds. Most expensive part of the ration.

Wet chemistry

A term used to refer to lab processes using chemicals. *In-vitro* NDFD measurement is an example of a wet chemistry procedure.

¹Oba M, Allen MS. Evaluation of the importance of the digestibility of neutral detergent fiber from forage: effects on dry matter intake and milk yield of dairy cows. J Dairy Sci. 1999;82(3):589-596.

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