

Forage Digestibility: How It Affects Your Bottom Line



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Forages have traditionally been tested for Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF). While these values determine how much of each type of fiber there is, they do not give any information as to how digestible, or

actually useable, the fiber is to the cow. A more accurate measurement in predicting how well cows will perform on a particular forage crop would be Neutral Detergent Fiber Digestibility (NDFd) and Undigestible Neutral Detergent Fiber (uNDF). The digestibility of NDF is a critical piece of information for balancing rations to maximize cow performance, improve cow health, and minimize ration costs by relying on as much home-grown forages as possible.

Testing for NDFd

Forages can be measured for NDFd and uNDF through In Vitro, In Situ, and Near Infrared (NIR) analyses¹. In Situ analysis involves placing forage into a small bag and placing it into the rumen of a cannulated cow for a designated period of time. The amount of NDF present before being exposed to the rumen fluid is compared to the amount of NDF still present when taken out, therefore determining how much of the NDF is digestible. This process is not typically performed by commercial labs as it is not timely or practical. In Vitro analysis is more common. This is when rumen fluid is added to a forage sample along with a buffer for a period of time, usually 24, 30, or 48 hours. While more common, and used to double check suspect forages, this method is not typically used for routine samples either. There has been enough testing through both In Situ and In Vitro to develop accurate and consistent equations to be used with (NIR) testing. NIR is the testing method most commonly utilized by labs because of the speed and low cost of the test.

When forages are tested for NDFd and uNDF, the results are listed in various time points. For example, NDFd30, NDFd120, and NDFd240 and most typically uNDF30 and uNDF240. The numbers

correspond to the number of hours it would take that fiber to be digested, or the amount of time the fiber can be present and still be undigested. These time points are critical for nutritionists as they lay out the three pools of NDF in a forage; the fast digesting fiber, the slowly digesting fiber, and the indigestible fiber. The uNDF240 refers to fiber that is indigestible, even after 240 hours in the rumen. By determining these 3 categories of fiber, nutritionists are able to estimate the passage rate of the fiber through the rumen, how much of that forage a cow may be able to eat, and how well a cow will perform on that feedstuff.²

Cow Performance

Dry Matter Intake: The indigestible fiber in forages, uNDF240, is what creates a rumen mat and fills the rumen as more indigestible fiber is consumed. While a healthy rumen mat is needed, feeds that are high in uNDF240 will limit dry matter intake, potentially reducing dry matter intake. Many studies have been done, and while the optimal amount of uNDF240 always seems to be a moving target, the maximum amount of uNDF a cow can consume usually falls between 0.35% and 0.45% of the cow's body weight per day.

Milk Production: Forages that are more digestible are able to be consumed at higher quantities because forage pass through rates are faster and there is less indigestible fiber taking up space in the rumen. This increases dry matter intake, which in turn increases the entire nutrient amount the cow gets in a day. This is a huge benefit as dry matter intake can drive milk production. Rumen microbes also benefit from the highly digestible fiber. The microbes in the rumen should be considered the number one source of protein to the cow every day. This protein from the rumen microbes is known as microbial protein. To maximize microbial protein, rumen microbes need Rumen Degradable Protein (RDP) and fermentable carbohydrates. One of the best sources of fermentable carbohydrate for the rumen is digestible fiber. When more digestible fiber is present, generally the rumen needs less starch and sugar to perform.

NDF digestibility can vary greatly. According to Dave Combs from UW-Madison, the digestibility of the NDF in average quality, alfalfa-based forage can vary from 30 to 60 percent. In a diet containing a moderate amount of this feed (15 lb. of dry matter) this change in digestibility could account for 8-10 lb. more milk³. With a current base price of \$19.01⁴, an average of 9 additional lb. per day, creates a potential increase in revenue of \$1.71 per cow per day. Focusing on digestibility pays!

Milk Components: Improving milk volume is not the only area fiber digestion can be a positive influence. Fiber digestion drives the production of acetic acid and butyric acids. These volatile fatty acids are responsible for producing butterfat in the udder and ultimately provide about half the butterfat present in milk. Increasing fiber digestibility results in an increased production of butterfat. The other fatty acids used for butterfat production can originate from the diet or from mobilization of body tissue⁵. While fiber digestion drives fat production through acetic and butyric acid, the highly digestible NDF also feeds the rumen microbes. These rumen microbes turn the dietary protein into the perfect package of amino acids for milk and milk protein synthesis. Rumen microbes utilize the highly digestible and highly fermentable NDF, as well as carbohydrates, like the starch from corn and dietary sugar, to maximize the protein that is degraded in the rumen and turn it into protein for the cow.

Cow Health

Ruminants thrive on high forage rations to support rumen function and overall animal health. When forages that are high in NDFD are fed, more forage can be consumed and cow performance can be sustainably supported. This ration strategy of feeding higher forage diets supports cow health and decreases the risk of many potential health issues like displaced abomasums, laminitis, and sub-acute rumen acidosis.

Ration Cost

When forage NDFd is low, ration costs inherently increase. Cows will not perform as well without increased supplementation. With less digestible fiber, cows need more fermentable carbohydrate, usually supplemented as corn, or sometimes a non-forage by-product like soy hulls or corn gluten feed in an effort to generate similar energy and microbial protein from the diet. This requires the purchase of off the farm feedstuffs and often affects ration effective fiber, decreasing the potential for a cow friendly ration. Along with fermentable carbohydrate, by-pass forms of protein often need to be increased to make up for the amount of lost microbial protein through lack of digestibility. These by-pass protein sources, like heat treated soybean products, quickly increase ration cost and often do not make up for a poor-quality forage.

Evaluating the digestibility of the forages on your farm could be a key to increasing your herd's performance and limiting your out of pocket expenses. Digestibility of forages should be tested by a licensed lab to determine which forages fit best in your rations and at what levels they can be fed. While testing for NDFd and uNDF is a critical first step, the information gained needs to be used properly to optimize the ration and improve profitability. Contact a Crystal Creek® nutritionist to learn how fiber digestibility can be used to maximize the profit on your farm.

Sources:

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