Requirements for Sample Grinding for NFTA Certification

Labs participating in NFTA certification are required to grind client samples to pass a 1mm screen using a cyclone mill.   This grinding protocol is what is used to generate samples for NFTA proficiency testing. NFTA requires as well that methods used to evaluate proficiency samples are the same methods used routinely in the certified laboratory.

The use of food processing mills, knife mills or other mechanical grinders do not produce a reproducible grind that is consistent with the NFTA 1mm cyclone mill definition and may not be used routinely for sample preparation by NFTA certified laboratories.

Background

Impact of Sample Preparation on NIR and Wet Chemistry Predictive Data: Grinding Method and Particle Size Variability

A much-discussed issue related to near infra-red analysis (NIR) of forages is the influence that sample preparation has on the analytical results. Particle size, specifically, is a very important component of sample homogeneity and impacts the ability to collect repeatable, representative NIR spectra. The chemical information provided through NIR also depends on physical information such as particle size and bulk density (particle size distribution and compact density). It is well-known that changes in particle size cause a change in the scatter of light. Samples with different particle sizes will greatly impact the NIR diffuse reflectance absorbance spectra of the wavelengths.

Wet chemistry analysis can also be affected by particle size. Not having a uniform and homogenous particle size can affect the kinetic parameter for fiber digestion and degradation. Digestibility and degradation rates of potentially digestible NDF and ADF residuals impact how energy availability is determined. Particle size of ground forage also influences *in vitro* digestibility and the concentration of cell wall constituents. Decrease in particle size deceases neutral detergent fiber, acid detergent fiber, and lignin concentrations.

According to the National Forage and Testing Association (NFTA) Forage Analyses Procedures, forage samples for NIR analysis require grinding with a cyclone mill to pass a 1-mm screen and must be thoroughly mixed. The use of food processing mills, knife mills, or other household grinders will have not only an impact on the forage sample produced, but also on its physical characteristics and homogeneity. As such, these are not acceptable sample size reduction methods. Preliminary data collected by Lemus (2018) indicated that the use of these common grinders can introduced up to 20% variability on the NIR predicted nutritive values, especially due to damaged fiber created by the shredding and fractionation effect of the grinder.

As stated in the NFTA Forage Analyses Procedures, clients of forage testing laboratories have a right to expect that their laboratories: (1) provide true measures of chemical composition and

nutritive value, (2) guarantee that results are consistent (repeatable) within a lab, (3) assure that results are comparable (reproducible) among labs and (4) insure that lab variation is not a major source of error in feed evaluation. Sample preparation technique has an impact on all four of these points. Therefore, when considering sample preparation techniques for NIR or wet chemistry analysis, NFTA member laboratories should follow NFTA sample preparation guidelines defined in Section A of the NFTA Forage Analyses Procedures to ensure homogeneity and repeatability of analytical results. Doing so will allow the lab to provide a sample that is at analytical fineness and homogeneous in accordance with AOAC Official Method 950.02. Only then, it is possible to guarantee meaningful and reliable defendable analytical results.

The NFTA processes forage materials to a very high level of homogeneity to develop a set of samples that can be used to accurately determine the proficiency of member laboratories. This protocol does not allow for NFTA to ship raw or unprocessed materials to individual labs, thus this approach regrettably does not allow for the certification program to evaluate member labs' sample preparation protocols.