THE IMPACT OF MOISTURE CONTENT ON FORAGE NUTRITIVE PREDICTIONS USING NEAR INFRARED SPECTROSCOPY (NIRS) ON PREPARED GROUND SAMPLES AND HOW THIS AFFECTS PRODUCERS AND RESEARCHERS

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ABSTRACT

Rapid forage testing using near infrared spectroscopy (NIRS) for nutritive analysis is an affordable alternative to wet chemistry that producers and researchers utilize. This instrumentation passes electromagnetic radiation through the material in a forage sample using a light source causing vibrational bonds to be detected (Burns et al., 2007; Pasquini 2018). These bonds are then converted to spectral peaks by the dispersive or diffractive grating-based analyzer (reference here). Since the material in a forage sample is Carbon (C) based and water is Hydrogen (H) based; the detected spectrum can be interrupted by the stretching and bending of the C-H groups (Pasquini 2018; Murray and Cowe, 2004). Therefore, any additional moisture in the sample will interact with the hydrogen bond making the spectra appear different and compared to neighborhood spectra within a model database (Undersander et al., 1993).

The issue of excess moisture found in scanned forage samples surfaced while observing the dry matter (DM) content from samples considered "outliers". There was a pattern noticed that most of the samples had more moisture content than others being scanned at the same time. Even in the early 1990s it was recommended to scan between 94-98% DM to minimize the spectral scattering effect from the water molecules (Undersander et al., 1993). However, this principle is not proven as to why it was recommended; therefore, the significant impact this project will have is proving the theory and reducing error in predictions. However, this principle is not proven as to why it was recommended. Additionally, this has not been practiced for calibration development. It is not that the models have not worked with higher moisture levels, but a target moisture level should be demonstrated to achieve the best scans possible for prediction (Graph 1). Identification of the appropriate scanning range is essential for accurate forage nutritive analysis predictions. With consistent sample moisture prediction accuracy can be improved as moisture in a forage sample creates additional error in the predicted nutritive analysis results when scanned on NIRS instrumentation.

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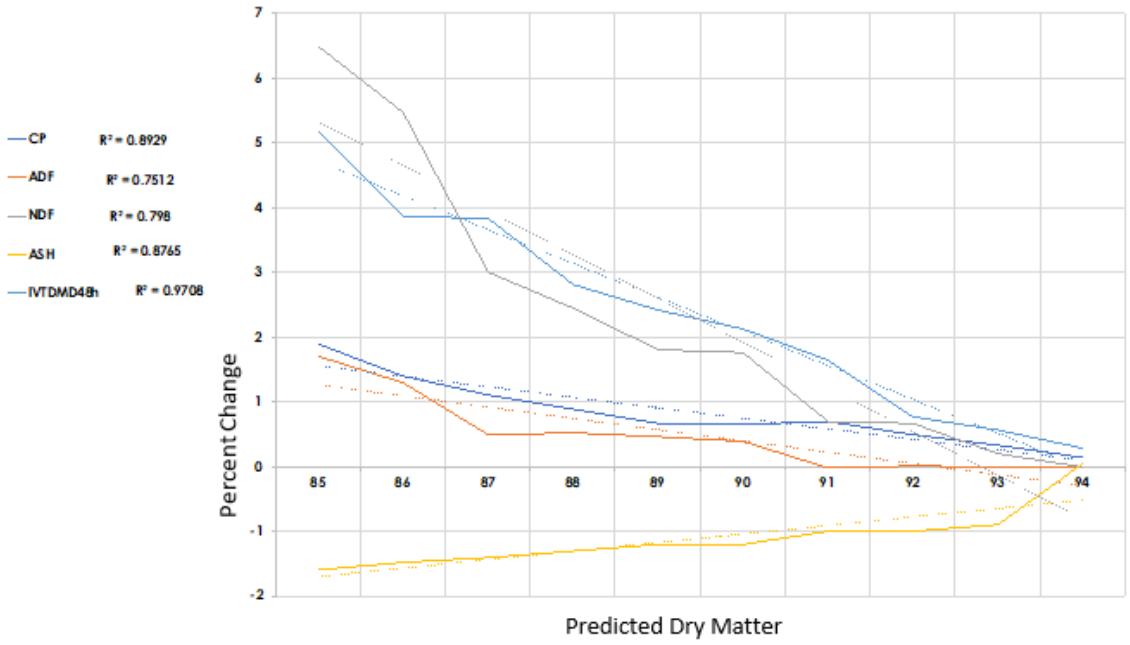
In: Proceedings, 2019 Western Alfalfa and Forage Symposium, Reno, NV, Nov 19-21. UC Cooperative Extension, Plant Sciences Department, University of California, Davis, CA 95616.

Graph 1: Percent change in nutritive value by predicted dry matter (DM) of forage samples. X-axis represents change in dry matter from 83.7-93.8% DM. Y-axis represents percent change in nutritive analysis results as DM increases).



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