

ACID DETERGENT FIBER, NEUTRAL DETERGENT FIBER CONCENTRATION, AND RELATIVE FEED VALUE

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C.C. Sheaffer, M.A. Peterson, M. McCaslin, J.J. Volenec, J.H. Cherney, K.D. Johnson, W.T. Woodward, and D.R. Viands

FIELD CULTURE

Establishment.....Uniform stands should be established to provide a minimum of 10 plants/square foot in the year following seeding.

Scheduling of Harvests....Dormant entries should be sampled at the first three harvests of the season; nondormants at the second, fourth and sixth harvest of the season. Fall harvests which occur during a dormancy reaction period should not be used for forage quality determination. Harvests should occur at bud to flower. Visually quantify alfalfa maturity using a 1-8 scale where 1=vegetative (stems have no buds or flowers); 2=early bud (1-33% of the stems have buds); 3=mid bud (34-65% of the stems have buds); 4=late bud (66-100% of the stems have buds); 5=early flower (1-33% of the stems have flowers); 6=mid flower (34-65% of the stems have flowers); 7=late flower (66-100% of the stems have flowers); 8=post flower (stems have pods or seeds). Do not adjust forage quality data for maturity. Report data individually for each harvest. Weighted average values across harvests can also be reported. Weighted values are calculated by summing the product of yield x (ADF %, NDF % or RFV) for each sampling before dividing by the number of samplings.

Stand AgeSample from stands in the first or second year following the seeding year and which have a minimum of 10 plants/square foot. Results from stands in the seeding year can be used as supporting data but cannot be used to fulfill minimum test year requirements.

Soil Fertility.....Test soil and apply fertilizer and lime to promote high yields.

Soil MoistureMaintain to prevent plant water deficit stress and to promote good crop yields.

Pest ControlAlfalfa should be scouted and insecticides should be applied when needed. The presence and severity of foliar diseases should be recorded.

SAMPLE COLLECTION AND PREPARATION

Sample Collection

Forage samples should be obtained from non-border areas of plots. Samples should be taken by hand clipping a minimum of 3 square feet per plot. If plots are not uniform, hand grab samples should be taken from multiple locations within a plot. It is unacceptable to collect forage samples from a flail-type harvester. Minimum sample size should be 300 g wet weight. Samples should be taken to a 5 cm stubble height.

Sample Preparation

Dry samples at 120 to 140° F in a forced air oven in less than 48 hr. For drying; cloth, perforated paper bags, or trays can be used. Grind samples to pass a 1 mm screen.

Laboratory Tests

Quality evaluation is based on determination of neutral detergent fiber (NDF, for intake), and in vitro digestible dry matter or acid detergent fiber (ADF, for digestibility) using wet chemistry or near infrared reflectance spectroscopy (NIRS). For both wet laboratory and NIRS procedures, it is assumed that procedures used have accuracy and precision required for scientific publication. Relative feed value is calculated using the following equations:

$$\text{RFV} = \frac{\% \text{DDM} \times \% \text{DMI}}{1.29}$$

and where % DDM (digestible dry matter)=88.9 - (.779 x ADF %)

$$\% \text{DMI (dry matter intake)} = \frac{120}{\text{Forage NDF (\% of DM)}}$$

Crude protein data can be included in a description of cultivar forage quality, but should be used only when accompanied by fiber and RFV data.

CHECK CULTIVARS

High QualityWL 322 HQ, Pacesetter, or Cimmaron VR

Low Quality.....Vernal

In a national test conducted over eight locations, Pacesetter, Cimmaron VR and WL 322 HQ averaged about 2% lower NDF and 1% lower ADF than Vernal when harvested at bud to flower maturity. High and low quality checks for nondormant alfalfa cultivars will be described when data become available.

SCIENTISTS WITH EXPERTISE

Craig C. Sheaffer
University of Minnesota
Dept of Agronomy and Plant Genetics
411 Borlaug Hall
1991 Upper Buford Circle
St.Paul,MN 55108
(612) 625-7224

Michael A. Peterson
W-L Research Inc.
8701 Hwy. 14
Evansville, WI 53536-9593
(608) 882-4100

Mark McCaslin
Forage Genetics International
P.O. Box 415
Prior Lake MN 55372

HELPFUL INFORMATION

Relative feed value (RFV) describes digestible energy intake potential of forages and can be used for comparison of relative forage quality of alfalfa cultivars. However, the relationships between intake and digestibility assumed in RFV calculation may not be applicable to all types of livestock.

ALTERNATIVE METHODS

For more accurate and precise determination of alfalfa maturity, maturity can be quantified using the mean stage by count or mean stage by weight methods⁽²⁾.

REFERENCES

1. Goering, H.K., and P.J. Van Soest. 1970. Forage fiber analyses (apparatus, reagents, procedures, and some application). USDA Handbook 379, U.S. Gov. Print. Office, Washington, DC.
2. Fick, G.W., and S.C. Mueller. 1989. Alfalfa quality, maturity, and mean stage of development. Cornell University Information Bull. 217
3. Linn, J.G., and N.P. Martin. 1989. Forage quality tests and interpretation. Minnesota Extension Service. AG FO-2637.
4. Mueller, S.C., and G.W. Fick. 1989. Converting alfalfa development measurements from mean stage by count to mean stage by weight. *Crop. Sci.* 29:821-823.
5. Shenk, J.S., M.O. Westerhaus, and S.M. Abrams. 1989. Protocol for NIRS calibration: monitoring analysis results and recalibration. p. 104-110. In G.C. Marten, J.S. Shenk, and F.E. Barton (ed). *Near Infrared Reflectance Spectroscopy (NIRS): Analysis of forage quality.* USDA ARS Handbook 643, U.S. Gov. Print. Office, Washington, DC.
6. Smith, Dale. 1973. Influence of drying and storage conditions on nonstructural carbohydrate analysis of herbage tissue-A review. *J. British Grassland Soc.* 28:129-133.
7. Stucker, R.E., and C.C. Sheaffer. 1991. Sampling procedures for predicting quality of alfalfa. p. 190. In *Agronomy Abstracts.* ASA, Madison, WI.
8. Undersander, D.J., B.E. Anderson, and N.P. Martin. 1991. Determining forage quality of alfalfa varieties. p. 191. In *Agronomy Abstracts.* ASA, Madison, WI.
9. Volenec, J.J., J.H. Cherney, and K.D. Johnson. 1987. Yield components, plant morphology, and forage quality of alfalfa as influenced by plant population. *Crop Sci.* 27:321-326.
10. Windham, W.R., D.R. Mertens, and F.E. Barton. 1989. Protocol for NIRS calibration: sample selection and equation development and validation. p. 96-103. In G.C. Marten, J.S. Shenk, and F.E. Barton (ed). *Near Infrared Reflectance Spectroscopy (NIRS): Analysis of forage quality.* USDA, ARS Handbook 643, U.S. Gov. Print. Office, Washington, DC.
11. Wolf, D.D., and T.L. Ellmore. 1975. Oven drying of small herbage samples. *Agron. J.* 67:571-574.