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ALFALFA INSIGHTS

VIRENXIA'S NEWSLETTER ON ALFALFA, THE QUEEN OF FORAGES

ALFALFA QUALITY ANALYSIS

FOCUS ON NUTRITIVE VALUE

Knowing the actual nutritive value of a hay is very important for both seller and buyer. High-quality hay brings a good revenue for the grower and allows the dairy to feed less forage to cows. Dairies want hay with a high relative feed value (RFV) and a high digestibility that contribute to maximum milk production.

Quality analysis is an important Alfalfa hay marketing tool for sellers and buyers, and sampling technique is a significant aspect of standardized hay testing. A hay quality analysis is valid only to the extent to which the sample represents the lot of hay. In addition, because the actual amount of sample that will be analyzed in the lab may be as little as 0.5 g, it is imperative that an accurate and representative sample be taken. Hay sampling errors can add more variation to quality results representing the whole lot than laboratory errors. A lot is defined as up to 200 tons of dry matter (approximately 225 tons of hay at 12% moisture) baled from the same field, cutting, and stage of maturity. Any given lot can be packaged in any form or size of bale or stack. Although there can be considerable bale-to-bale variation, proper sampling practices will incorporate this variability to represent the overall quality of the lot. This issue reviews hay sample techniques and quality aspects of Alfalfa hay.

MAXIMIZE HAY FARMING AND FEEDING WITH HAY TESTS

Forage testing is done to estimate the intake and performance by livestock. Low-quality hay does not allow a high-producing animal to consume enough digestible energy to be highly productive.

High-quality hay has high nutrient concentrations, high digestibility, high intake potential and high efficiency of utilization. Determination of nutritive value by laboratory chemical analyses, spectral (light sensing) instruments or biological assays is a challenging process, but it is critical to a good marketing plan or allocation to the correct livestock class, if you feed it yourself.

Although the initial investment for equipment is high, NIRS is quicker and cheaper than laboratory chemistry.

Currently accepted techniques of forage analysis include traditional wet chemistry and Near Infrared Reflectance Spectroscopy (NIRS); NIRS is a newer technique that uses light reflectance. Although the initial investment for equipment is high, NIRS is quicker and cheaper than laboratory chemistry and gives equivalent results. Some laboratories will use only one technique, while others use both.

VIRENXIA Alfalfa farm in Oman

Getting the most from a hay test

1. Recognize the large natural variation in forage quality within a field, a windrow, a bale and within a stack.
2. Understand the sources and magnitude of chance of error, which includes sampling, comparing forages with different moisture concentrations, between laboratory methods used for each parameter, between laboratories, between different batches; distinguish between analyzed versus calculated estimates; and realize quality declines with time and environment of storage.
3. Follow correct protocol to core bales with an approved sample probe.
4. Choose authorized certified laboratory and stick with them.
5. Know the range of normal values for important parameters.
6. If a value is not what you expect, visit with the laboratory representative. They will probably rerun or resample. If you want to compare labs, ask them to send the ground sample they analyzed to the other lab.
7. Understand there are no absolute values for parameters, just estimates and calculations.

Why is a hay test important?

Dairy, beef, equine and export markets utilize the majority of hay sales. Producers need to know the forage quality to be able to negotiate a fair price. Even when you use hay in your own feeding operation, you need to know the nutritional information for the hay or forage. Allocating the best forage to meet the needs of each class of livestock is possible by inventory and forage quality tests. The forage quality inventory will give you information on what nutrients should be targeted for purchase as supplements or what additional forage may be needed.

Producers need to know the forage quality to be able to negotiate a fair price.

It need testing hay for neutral detergent fiber (NDF), digestible neutral detergent fiber (dNDF), crude protein, ether extract (fat), neutral detergent fiber crude protein (NDFCP) and ash.

These components are required to calculate the summative total digestible nutrients (sTDN) that is used by most dairy nutritionists.

Neutral detergent fiber digestibility (dNDF) is one of the most variable forage parameters. It can range from 40 percent of dNDF for highly lignified mature legumes to greater than 90% for relatively low lignified immature grass. Thus it has the greatest potential to separate forage quality into classes based on biological value.

Assessing fiber digestion not easy

Poor digestion <40%

Excellent digestion >50%

A 2-3 unit change in fiber digestibility corresponds to 1 lb change in milk yield.

It is recommended that relative forage quality index (RFQ), which also uses dNDF and replaces the older and less accurate relative feed value index (RFV). The RFQ index provides a much better prediction for grass and grass mixed hays because the digestibility of NDF in grass hays is higher than in alfalfa, so RFQ will rate grass forages more appropriately than RFV.
However, RFV and RFQ are only useful for allocation of a class of forage to a group of livestock, or for marketing negotiations. Nutritionists do not use RFV or RFQ in any ration balancing methods.

Ash levels greater than 10% indicate excessive soil contamination and will result in lower digestibility and respiratory issues for livestock consuming the hay and also suggest increased wear and tear on the baler, feeder and cows' teeth.

Be sure to use accredited and certified laboratory. Either wet chemistry or NIRS methods are good with a certified laboratory.

Sampling guidelines for hay testing

The best method obtains core samples that proportionately represent the hay. Core sampling provides a representative sample to a laboratory, which grinds and further subsamples to a thumbnail-sized sample, 1 to 3 grams, representing multiple tons of hay (see Figure 1). The sample must represent the leaf-to-stem ratio, which varies throughout the bale, as well as the various weed compositions across the lot of hay. Each core sample should represent the individual bale, and enough cores need to be taken to represent the stack or lot.

The sample must represent the leaf-to-stem ratio.

Fig. 1

The amount of ground sample analysed by chemistry or near infrared reflectance spectroscopy (lower right) is small in relation to the core sample (lower left and center) of one lot of hay that is sent to the lab. The stack of hay in the background is three separate lots from the same field, each from a different cutting.

Individuals sampling should take at least 20 cores, sampling perpendicular to the butt end of the bales, inserted 12 to 18 inches into the bale, and handle the sample properly as described below. Forage quality declines with time even if optimally stored. A sample taken from the same lot of hay the day it is bale is expected to have lower fiber values than a sample taken from the same lot six months later.

Coring guidelines

1. Choose a good, sharp coring tool.
2. Identify a single lot of hay.
3. Probe rectangular bales from the butt end as near center as possible. Round bales should be cored from the curved side.
4. Probes without a sample container must be emptied after each time the probe is inserted. With multi-samplers, the ramrod should be used after each sample to push the contents of the probe into the container.
5. The goal is to take unbiased samples, either from random locations or predetermined systematic locations. A system of sampling the stack at regular intervals and sampling the entire length of the stack can provide 20 non-biased samples.
6. Large or small bales require 20 cores (each from a different bale) to be representative of the entire lot of hay. A half-pound sample is about the right amount. Take more cores (20 to 40) in larger lots or if the hay is variable and divide them into subsamples based on the length of the stack.
7. Collected core samples from one lot of hay can be combined into a single sample or in six or more cores per bag, providing three samples, and stored in sealed polyethylene freezer bags. Each container represents a forage sample, and should be identified by a date, cutting, forage type, location and owner. Some labs provide plastic sealable bags with labels that allow the above information and type of analyses desired.
8. Handle the samples correctly. Do not expose the samples to heat or direct sun; keep the samples cool; and send them to the laboratory as soon as possible.
9. Use accredited certified lab and stay with them.

Choosing a hay probe

A hay probe needs to be used for sampling hay; **never use the "grab" or "flake samples" methods.** There are many different types of probes, and each design has advantages and disadvantages. The following are some important considerations in choosing a hay probe:

- ✓ Good, sharp tip; serrated or scalloped for drill-type; scalloped or straight for push-type; ability to sharpen and/or replace the tip
- ✓ Can be push- or drill-type; single or multiple sample container (see Figure 3)
- ✓ Ease of use and easy penetration into the bale
- ✓ Length of shaft 12 to 24 inches
- ✓ The collection of 20 cores from a 3/4-inch diameter by 12-inch deep core will sample a volume of 5.3 cubic inches, while a 5/8-inch diameter by 12-inch deep core will sample a volume of 3.7 cubic inches
- ✓ Has a collection container as a mechanism for core removal
- ✓ Ease of sample removal
- ✓ Produces about a half-pound (250 grams) of sample in 20 cores
- ✓ Durability and ease of transport

Fig. 3

Compare (A) the 3/4-inch diameter serrated tip on a 1-inch tube of a Penn State drill-type single-sample probe with (B) the 3/4-inch diameter scalloped tip on a tube of an AMS drill-type multi-sample probe and (C) the 1/2-inch diameter scalloped tip on a Star Quality multi-sample push probe. Probes B and C have a sample container. The remaining item is a wooden or plastic plunger (dowl) that comes with probes to help remove core samples from the probe.

Each container represents a forage sample, and it should be identified by a date, cutting, forage type, location and owner.

Source: Glenn Shewmaker, University of Idaho

HOW IS THE QUALITY OF THE FORAGE YOU ARE FEEDING

Growing animals require 10 to 14% crude protein.

All legumes, first-cutting cool-season grasses and warm-season grasses should be about 50% leaves when they were mowed (second and later cuttings of cool-season grasses should be close to 100% leaves). Less than 50% leaves in harvested hay means you have lost yield, protein and energy.

10% yield losses during harvesting seems to be about average. However, if the final forage is one-third leaves and two-thirds stems (which is common), you have lost about 20% of the yield and much greater percentage of the quality that was available in the standing forage.

First, look at the leaf content of forage—is it close to 50% leaves? Leaves have 400 to 500 relative feed quality (RFQ) and 20 to 30% crude protein, while stems have about 80 RFQ and 6 to 8% crude protein. Milking cows need about 16% crude protein and all the energy they can get.

Growing animals require 10 to 14% crude protein, depending on physiological stage and all the associated energy they can get from forage. Pregnant beef cows have often been neglected, but many now recognize that those animals on a higher plane of nutrition and body score of 5 or 6 will tend to have healthier and growthier calves; thus, pregnant dry cows will benefit from high-quality forage.

In addition, in cold weather cattle outdoors needed 10 to 15% more energy to stay in good condition. Thus, many farmers save the best hay for feeding beef in winter months.

Why is leaf retention so important?

Consider this: Leaves have a neutral detergent fiber (NDF) value of 15 to 20% and a relative forage quality (RFQ) of about 550. Stems have an NDF value of 60 to 70% and an RFQ of only 70 to 80. Virtually all of the protein value of alfalfa is also in the leaves.

Standing alfalfa is, on average, about 50% leaves and 50% stems at the bud stage. In research studies and farm field determinations, the average decline in leaf content following a harvest is about 20%. However, the amount of leaf loss can be quite variable, ranging from a small percentage to over 40% of the total leaf content.

Alfalfa is, on average, about 50% leaves and 50% stems.

Many sources of leaf loss

The tricky thing about leaf loss is that it occurs at multiple production points. Fungal diseases can be responsible for significant leaf loss, especially within the canopy. It can also intensify as the crop matures, bringing us back to time of cutting as our first priority for high-quality alfalfa.

Leaf loss also occurs during cutting and conditioning. Flail-type conditioners work well for grass crops but act as large leaf strippers in alfalfa. Roll conditioners, either rubber or steel, are a much better option in alfalfa.

One practice that is not done often enough is to check the ground both before and after cutting to assess how much leaf loss is occurring before any swath or windrow manipulation even begins. Although there are many other factors that impact alfalfa quality, a focus on time of cutting and leaf retention will go a long way into accomplishing the ultimate goal.

Source: Dan Undersander, University of Wisconsin

ALFALFA: INNOVATIONS

Mobile app to detect Mycotoxins

"Mycotoxins," a mobile app developed by the University of Arkansas System Division of Agriculture, can help corn, Alfalfa growers spot dangerous Mycotoxin issues and learn what to do about them.

The free, informational mobile app is intended for use by corn and alfalfa growers, crop consultants, county extension agents and others in crop production and seed industries, according to Burt Bluhm, associate professor of plant pathology for the University of Arkansas System Division of Agriculture.

Source: Burt Bluhm, University of Arkansas

It was developed as a collaboration between the division's department of plant pathology and the department of botany and plant pathology at Purdue University.

Mycotoxins like Aflatoxin are dangerous health risks to human and animal consumers, Bluhm said, and under strict health regulations, **they can cause huge economic losses for Corn, Alfalfa growers.**

A 2015 USDA-funded study by researchers at Michigan State University and Iowa State University estimated that Aflatoxin, the most problematic Mycotoxin disease in the U.S., could cost growers $52 million to $1.68 billion each year.

A version of the app for Apple iOS was developed by Alex Zaccaron, a research assistant in Bluhm's lab. Zaccaron collaborated with developers at other institutions to produce an Android version.

The app is self-contained in the download and doesn't require an internet connection for use in fields where connections may be poor or nonexistent.

Modules in the app include "Ear Rot Identification," containing descriptions and high-resolution photos to help growers identify the most common corn ear rot diseases. Other modules contain information about Mycotoxins, on ear rot management and how to store moldy grain.

The app can be used on any Apple or Android smart phone or tablet.

Pocket-size NIR spectrometer transforms feed analysis

Chr. Hansen joins forces with Consumer Physics to use and distribute SCiO—a revolutionary feed analysis solution based on the smallest available pocket-size NIR spectrometer. The solution will be rolled out first in the U.S.—with the intention to roll out globally over time.

This device offers instant feed and forage analysis with a click of a button, enabling nutritionists and consultants to troubleshoot variations and adjust rations during farm visits. It allows real-time testing, and it is more accurate and simpler to use than the cumbersome on-farm alternatives.

With this device, nutritionists can instantly fine-tune formulation and proactively detect inconsistencies in a matter of seconds.

Empowering farmers, this feed analysis device is an innovative response to the dairy industry's need to constantly strive for a more productive and efficient operation. It allows farmers to:

- Track dry matter on a daily basis and optimize TMR rations
- Control dry matter during the harvest season of corn, alfalfa and other forages
- Enable the farm nutritionist and feed consultants to monitor trends remotely to avoid unexpected milk yield drop due to feed inconsistencies.

This device offers instant feed and forage analysis with a click of a button.

Source: Damian Goldring, Consumer Physics, USA

MARKET INSIGHTS

ALFALFA HAY

Alfalfa Hay market prices in US markets *(As of 17 September, 2019)*

Alfalfa hay prices reported to USDA from selected states.			
	Forage Quality Grade		
Location	Premium+	Good	Fair
	$ per ton		
California	185-270	165-225	150-190
Colorado	180-323	150-200	135(d)
Idaho	175	150	N/A
Iowa	200-340	120-200	93-118
Kansas	170-240	160-175	90-155
Minnesota	160-275	120-170	75-125
Missouri	170-225	120-160	100-125
Montana	150-225	110-180	75-125
Nebraska	N/A	100-160	N/A
New Mexico	200(d)-320	150(d)-220(d)	130(d)-150(d)
Oklahoma	242(d)-244(d)	180(d)-200(d)	N/A
Oregon	190-250	140-170	N/A
Pennsylvania	250-415	N/A	N/A
South Dakota	230	120-165	90-130
Texas	195-330	185-230	N/A
Utah	N/A	N/A	N/A
Washington	N/A	190-230	175
Wisconsin	265-270	180-210	90
Wyoming	180-270	150-165	120-140

Source: USDA Hay market prices

TABLE 1	Monthly average prices received for Premium and Supreme alfalfa hay in large dairy states ($ per ton), 2019			
State	March	April	May	June
	(Dollars per ton)			
California	235	235	225	225
Idaho	170	170	170	190
Michigan	180	190	200	200
Minnesota	215	236	232	211
New York	212	222	222	246
Pennsylvania	278	288	294	296
Texas	258	255	247	235
Wisconsin	247	252	264	252
Five-state total[1]	213	219	222	217

[1]Five-state total represents a weighted (hay purchases) average price for the five largest milk-producing states (based on the pounds of milk produced during the previous month): California, Idaho, New York, Texas and Wisconsin.

Source: USDA National Ag Statistics Service

Hay prices in Canada *(As of August, 2019)*

CANADA				
LOCATION	SIZE	TYPE	GRADE	PRICE/TON
CA – Alberta	Large Square	Alfalfa	Good	$155
CA – Alberta	Large Round	Alfalfa/Grass	Premium	$230
CA – Saskatchewan	Large Round	Alfalfa	Supreme	$250
CA – British Columbia	Large Square	Alfalfa	Supreme	$312
CA – Manitoba	Large Round	Alfalfa/Grass	Premium	$160

Organic hay prices in US

USDA's July 31 Organic Hay report showed f.o.b. farm gate prices paid for Premium/Supreme alfalfa small square bales averaged $200 per ton. Fair mid square bales of alfalfa brought $555 per ton.

Alfalfa Hay Exports from US

June Alfalfa hay shipments totaled 212,456 MT, falling about 16,000 MT from May's eight-month high. The June Alfalfa hay exports were valued at $68.5 million, down nearly $5 million from May.
At 1.25 million MT, January-June 2019 exports of Alfalfa hay are slightly behind last year's pace.

Among leading markets, Japan led all Alfalfa hay buyers in June, at 61,918 MT, followed by China, at 56,909 MT.
Sales to Saudi Arabia remained strong, while shipments to the UAE, South Korea and Taiwan were down.

Source: Market reports and precipitation outlook, USA

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2909/2910 Burlington Tower, Business Bay, DUBAI, UAE

For suggestions: info@virenxia.com