FORAGE SAMPLING PROTOCALS AND HAY SAMPLING DEVICE FEATURES

Jody A. Gale, J. Earl Creech, Glenn E. Shewmaker, and Daniel H. Putnam[1]

ABSTRACT

Testing forage is important to determine nutrient levels of forage grown for livestock feed. Test results provide analytical information needed to characterize forage quality, determine use, establish price, and balance high performance least cost feed rations for livestock. It is critical that a composite forage sample is representative of the forage. The small size of the sample must be considered in relation to the many tons of forage it will represent. Analytical laboratories prepare the sample by grinding forage to a fine power, mixing it, then using a tiny amount for analysis. Composite forage samples should be taken using established, research based, protocols recommended by the National Forage Testing Association (NFTA) (https://www.foragetesting.org/. Equally important is to use a sharp, well designed, sampling device for dry forages or methods for sampling high moisture forages. When recommendations are followed, the composite sample and the associated analysis will accurately represent the forage. The first step of the sampling process is to identify the "lot". In simple terms, a lot it is defined as harvested forage that has had similar treatment. A lot should be from the same cutting, same field, same variety, same stage of maturity, etc. Production factors and field conditions that cause variation in forage quality should also be considered. They may include soil type streaking, ununiform fertilizer applications, inconsistent irrigation, large patches of weeds, humidity changes during bailing, etc. Variation in a lot can be reduce by identifying large and separating large amounts of forage or hay that has not had similar treatment. Forage can them be stacked and stored in separate lots during hauling. However, the purposes of taking many cores from many bales from many in the lot will average out the extremes and compensates for normal, reasonable variation. The concept of forage sampling is not unlike soil sampling. Taking a biased shovel full or a core of soil from one or two spots in an 80 acres field will not accurately represent the soil of the field. Collecting loose, flake type grab samples by hand from dry, windrows or bailed hay, will also not accurately represent the lot of hay. As grab samples are taken from dry forage, leaves and other small, usually of higher quality parts of the plant are lost. The sample will be then be biased and the report will show lower quality than the real quality of the forage. NFTA protocol recommends that hay sampling device be used to sample dry, bailed hay by horizontally taking a single core from the middle of the butt end of a bale. At least 20 cores (one per bale) should be taken from at least 20 bales of the lot of hay. A lot of dry hay can be up to 200 tons. During the sampling process, the 20 individual cores are combined together in the sampler collection cannister or in a bucket and mixed together to form the "composite" sample. NFTA recommends using hay sampling devices with a 12"-18" long probe with at least a 3/8" diameter sharp cutting tip (Undersander, et. al., 1993).[1]

---

[1] J. A. Gale (jody.gale@usu.edu) Associate Extension Professor-Sevier County Agricultural Agent-Southern Area Economic Development, Utah State University Extension, 250 N. Main, Sevier County Adm. Bldg., Richfield, UT 84701. J. E. Creech (earl.creech@usu.edu) Associate Professor-Extension Agronomist, Plant Soils and Climate Department, Utah State University, 4820 Old Main Hill, Logan, UT 84322-4820. G. E. Shewmaker (gshew@uidaho.edu) Professor, Extension Forage Specialist, University of Idaho Extension, Kimberly Research and Extension Center, 3793 N 3600 E, Kimberly, ID 83341-5082. D. H. Putnam (dhputnam@ucdavis.edu) Professor, Alfalfa and Forage Extension Specialist, University of California at Davis, One Shields Avenue, Davis, CA 95616. **In:** Proceedings, 2019 Western Alfalfa and Forage Symposium, Reno, NV, 19-21 November, 2019. UC Cooperative Extension, Plant Science Department, University of California, Davis, CA 95616. (See http://alfalfa.ucdavis.edu for this and other Alfalfa symposium proceedings.).

Large diameter tips and probes needlessly take very large samples that require extensive grinding time at the lab. Sampling high moisture or wet forage can be done by carefully taking a grab sample from a horizontal pit or silo. Again the sample should be taken from forage that has had similar treatment. During harvest, take 20 sub samples from various loads or layers to determine dry matter content needed to calculate yield. However, when testing for quality of silage, wait for at least two weeks after the ensiling fermentation process has completed. Samples can be taken from the open faces of a horizontal bunker after it is opened up for feeding or from an unloader for vertical silos. Spoiled silage from the top, sides, or exposed face of bunkers that have been exposed to the air for several hours should not be sampled. Some larger diameter sampling devices work well to collect cores of wet forage in large plastic ag bags. Contact your lab for sample handling procedures and shipping instructions to assure samples is handled correctly in transit and not stalled in shipping facilities over a weekend. Some types of high moisture forage samples may need to be frozen and shipped in insulated packing material. Wet and dry forage samples should be kept out of the sunlight, properly packaged, shipped, and stored to prevent degradation before analysis. Decisions on forage use, quality, and value based on test results from a non-representative or degraded sample, cause unpredicted livestock performance and damaged reputations of growers, forage brokers, and nutritionist. When research based NFTA sampling protocols are followed and well-designed sampling devices and methods are used, those in the forage supply chain can be confident that test results accurately represent the forage. They can obtain similar test results from accredited laboratories using the same sampling protocols, devices and methods. Experience and research by Extension faculty and specialists at Utah State University Extension, University of Idaho Extension, and University of California Extension at Davis have identified several important design features of hay sampling devices. The study compared 18 commercially available, widely used, or readily available hay sampling devices. The lot of hay sampled consisted of 70 one-ton bales of third crop alfalfa hay harvested from the same field. Each sampler was used to take the recommended 20 cores for the composite sample. This was done by coring horizontally into the butt end of the bale and at the same relative position near the center. Each core was analyzed by an accredited Near-Infrared Spectroscopy (NIRS) university laboratory and results were averaged for a composite analysis. Each sampler with their respective design features were evaluated for accuracy and usability. Important design features included, cutting tip diameter, smaller inside tip diameter than probe tube, serration, straight tips are more accurate than slant tips, and tip bulb out effect. A separate study of core position in the butt end of a bale was also completed. Variation in forage quality decreases from the top of the bale to the bottom supporting the concept for sampling in the middle of the bale.

Key Words: Forage sampling, hay probe, hay sampler, hay sampling device, sampler

REFFERENCES

Undersander, D., D.R. Mertens, and N. Thiex. 1993. Forage Analysis Procedures. National Forage Testing Association, Omaha, NE 68137. https://www.foragetesting.org/lab-procedures p.129-130.