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Measuring Dry Matter in Ensiled Forages

Noelia Silva-del-Río, UCCE Tulare

In a recent study conducted in three California dairies, Dr. Rossow et al. (2011) observed that most of the variation between the ration fed and the ration formulated was explained by unaccounted changes in ingredients' dry matter (**DM**). Therefore, we should routinely evaluate feedstuff's DM, especially wet products, like silages. Results from a recent feeding management survey (Silva-del-Rio et al, 2010), indicates that dairy producers (52.3%) evaluate corn silage DM at least once a month, but only 8.3% of dairies determined DM weekly, or more often. Most dairies (86.6%) delegated DM determination to an outside consultant.

The frequency of forage DM determination in California dairies may be inadequate. The University of Wisconsin recommends 1, 2, 3, 4, 6 or 7 DM determinations per month for dairies with 50, 100, 200, 400, 800, or 1,600 cows respectively. When developing a sampling plan, we should also consider the weather conditions. After a rainfall event of 20 mm (0.8 inch), two ensiled forages with 30% and 50% of DM became wetter, 25.9% and 43.1% of DM respectively (Mertens and Berzaghi, 2009). In California, some dairies have reported an increase in the incidence of displaced abomasum during the rainy season. This could be explained by failing to adjust the loading sheets for wetter forages resulting in rations short on forage fiber.

Following are descriptions of the equipment and methods that can be utilized to determine DM:

- Air-circulating oven: This is the standard method but is expensive and requires 24 to 48 hours of drying.

- Koster tester: It is an electrical device that pushes hot air through a grid in which we place the feed. It has a timer which allows the operator to perform other tasks while the feed dries. The results are available in about two hours. The equipment cost is around $340.

- Microwave: It has the advantage of being fast (20 to 30 minutes). However, it requires the presence of an operator. To prevent the sample from overheating and burning, the operator should turn the microvawe on and off every 3 to 5 minutes a glass of water must be placed inside. Never dry forages in a microwave used for human food because pathogenic microorganisms are found in silages.

- Vortex Dryer: This device is fast, easy to use and inexpensive. It is made with a hair drier attached to a vortex. The cost is $85 at the Pennsylvania State University. However, it does not come with a timer. http://www.abe.psu.edu/pennstatepulling/vortex/

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- Food Dehydrator: This method is easy but requires 2 to 8 hours.

- Near-Infrared (NIR): The NIR boxes are available for use on dairies. They are quick (1-2 minutes) and easy to use, but very expensive.

There is one company that offers a NIR unit attached to the skid loader bucket. The NIR unit combined with feeding management software, and a mixer wagon scale, allows the feeder to receive real-time information on the correct ingredient weights that he must load. They also offer portable NIR units.

Another company markets a NIR unit that can be placed in the trunk of the chopper or on a table top. When placed on the chopper, harvesters can use the real time DM information to adjust the cutting settings. When placed on a table top, the NIR unit can be used at the dairy to determine the DM of the feed.

It is essential to have one of the devices mentioned above and a calibrated scale to accurately determine DM on the farm. The mathematical calculations to determine the DM are simple as shown in the example below:

- Container weight: 300 g
- Container +sample weight before drying: 450 g
- Sample weight: 150 g (450 g-300 g)
- Container + sample weight after drying: 355 g
- Weight of dry sample: 55g (355-300 g)
- Dry Matter:

55 g (dry weight) / 150 g (wet weight)
X=55/150=36.7%

Before using the new DM results to adjust the ingredient load sheets we should consider the following:

- If the most recent results indicate that DM has changed 3 points or more, it is recommended to repeat the DM measurement and evaluate if the appearance of the ensiled crop matches the results.
- If the most recent results indicate that DM has changed 1 point or more and the same result is found consistently (± 1 point for three consecutive days) the ration should be adjusted.

St Pierre and Weiss (2007) recommend weighted averages of the three most recent DM results. So, the most current DM result will be assigned a weight of 50%, the second most current result of 30%, and the third most current 20%. However, when applying the weighted average we should consider possible events (such as rain) that make it more suitable to use that day's results rather than the weighted average.

Frequent evaluation of silage DM is critical to ensure that cows are eating the balanced ration that the nutritionist has formulated.

Recommended Reading:

Mertens D. and P. Berzaghi. 2009. Adjusting for forage variability via on-farm analysis. *In* Proccedings, Getting more from forages, July 29 - 30. http://www.ars.usda.gov/Main/docs.htm?docid=18232

Pat Hoffman, Randy Shaver, and Paul Dyk. Forage Sampling Frequency as Influenced by Dairy Herd Size
http://www.uwex.edu/ces/crops/uwforage/
by ForageSamplingFrequency-FOF.pdf

Rossow H.A., R.J. van Hoeij and G. Acetoze. 2011. Differences in nutrients formulated and nutrients supplied on three California dairies. J Dairy Sci (Suppl 1) 94:131.
http://jtmtg.org/2011/abstracts/0116.PDF

St-Pierre N., and W. P. Weiss. 2007. Understanding feed analysis variation and minimizing its impact on ration formulation. Proc. Cornell Nutr. Conf. Syracuse, NY.

Silva-del Río N., J. M. Heguy, A. Lago. 2010. Feed management practices on California dairies. J. Dairy Sci. Vol. 93, E-Suppl. 1 p 773
http://cetulare.ucdavis.edu/files/74080.pdf

Cleaning Milking Equipment

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Proper cleaning of milking equipment contributes to ensuring that high quality milk is produced on the dairy farm. Goals of cleaning milking equipment are to (1) prevent microbial growth and (2) remove residual milk solids.

Residual milk solids are called 'soils' and contain both organic and inorganic materials. Soils that are retained on the inner surface of the milking system provide nutrients and areas for bacteria to grow, and these soils also reduce the effectiveness of the cleaning and sanitizing compounds. The milking system includes the milking claws and inflations, receivers, pipelines, and milk storage tank – everything that comes into contact with milk. Washing the milking equipment requires that you monitor (1) time, (2) temperature, (3) pH, and (4) agitation. Ensure that liquids are flowing through all of the milking machines, that hoses remain in place, and that agitation is occurring in the pipelines (evidenced by water flowing into the receiver). In this article, we'll discuss how to monitor the cleaning of your milking equipment by using a watch, thermometer, pH paper and a watchful eye that pays attention to detail.

To the and the to

clean the milking equipment associated with milking claws inflations, receivers, and supply lines, major steps are ***'Rinse, Wash, Post-Rinse, and Sanitize'***. The parameters (time, temperature, and pH) will vary slightly for each facility, but the basic principles are the same for all washing systems.

1. Rinse

Ideally, pre-rinse all surfaces immediately after milking with lukewarm (100 to 110^{o} F) water to remove milk solids. Lukewarm water should be used when adequate hot water supply allows for both a warm water pre-rinse and hot water wash. The initial rinse water contains residual milk (Figure 1). When done properly, this rinse removes more than 70% of the soil load. **Do not** re-circulate this water through the milking system. Discharge the rinse water and continue the rinse cycle until the water appears clear (Figure 2).

Figure 1. Residual milk rinsed from pipelines. **Figure 2.** Clear water rinsed from pipelines.

With your thermometer, monitor the temperature of the rinse cycle at the return line:

- Rinse water temperature below 93 ^{o}F will allow milk fat to deposit on milking equipment surfaces.
- Rinse water temperature above 120 ^{o}F will denature any remaining protein and create protein films. These films are colorless at first, but develop a yellow color as they build up. Protein films provide contact areas on surfaces where bacteria can grow

Drain all rinse water before beginning the next step.

2. Wash

To prevent premature cooling of the wash solution, turn off the vacuum pump while refilling the system with hot water and detergent. Most dairy farms use a chlorinated alkaline detergent in either liquid or powdered form. Add your detergent to the wash water according to manufacturer specifications.

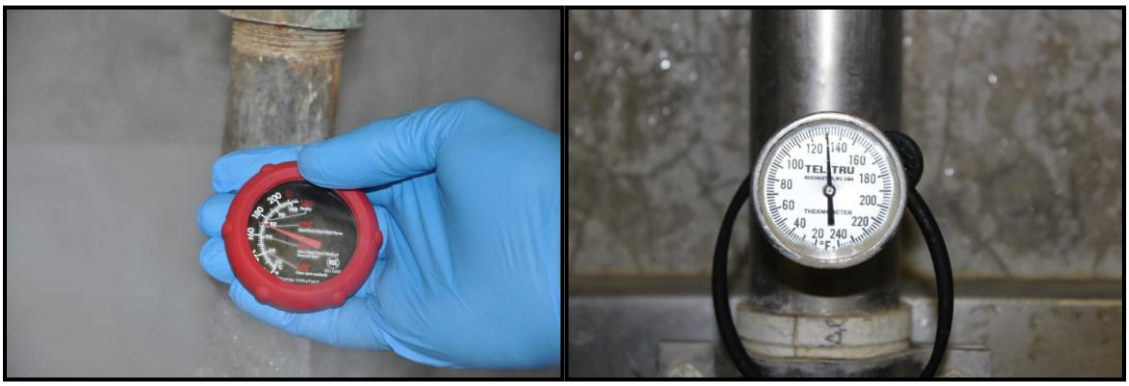
Why an alkaline detergent? Milk fat and water do not mix. The (basic) pH of the detergent breaks up any remaining milk fat into tiny droplets, suspending the fat in the detergent wash water. Use your pH paper to check that the pH is between 11 and 13 (Figure 3).

Figure 3. Check that the pH of the detergent solution is between 11 and 13. Remember to use safety equipment (gloves and goggles) to protect from splashing.

Why chlorinated? The chlorine increases the solubility of any remaining protein and helps to remove it with the detergent wash water during the wash cycle.

The temperature of the chlorinated alkaline detergent solution should be between 160 and 170 ^{o}F (Figure 4) at the start of the wash cycle – check this with your thermometer. Typically, the wash cycle is at least 10 minutes, but this will vary with each parlor depending on size and type of parlor. It is important that the temperature of the chlorinated alkaline detergent wash does not fall below 120 ^{o}F (Figure 5) as it leaves the system (check this with your thermometer), because any milk solids either in solution or in suspension may be re-deposited on contact surfaces. The temperature of the wash water should be measured for each wash cycle. Use your watch to time the wash cycle and your thermometer to measure the temperature of the wash water at the sink.

Temperature and time should be monitored during different seasons of the year – the different seasons (summer versus winter) can have an impact on time and temperature conditions for your wash system.



Figures 4 and 5. Check that the initial temperature of the chlorinated alkaline detergent solution is between 160 and 170 ^{o}F, and return solution does not drop below 120 ^{o}F.

In all cases, hot water volumes need to be sufficient to allow wash cycles to run at least 10 minutes above 120°F. If this standard can't be met, hot water storage volumes must be increased.

Drain all chlorinated alkaline detergent wash solution before beginning the next step.

3. Post-Rinse or Acid Rinse

Rinse the milking system with lukewarm (100 to 110 ^{o}F) acidified water for 3 to 5 minutes. Use your pH paper to check that the pH is between 3 and 4 (Figure 6). The acid rinse prevents any milk minerals from accumulating on surfaces. When minerals collect with organic material on equipment surfaces, milkstone (a white, chalky film) develops. Milkstone provides areas on contact surfaces for bacterial growth within the milking system. The acid rinse reduces the pH of the equipment, which helps to prevent bacterial growth between milkings. The acid rinse also neutralizes the chlorine and alkaline residues from the wash cycle and helps to prolong the life of any rubber parts.

Figure 6. Check that the pH of the acid rinse is between 3 and 4.

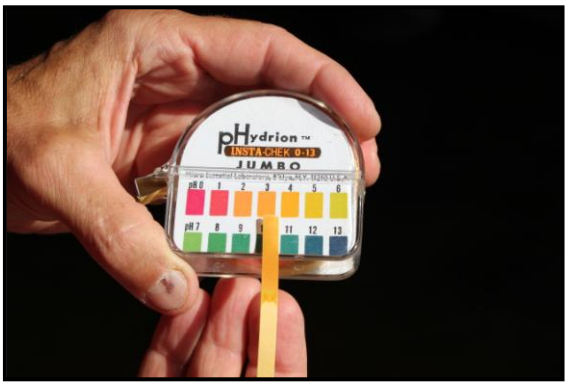
4. Sanitize

State and Federal regulations require that milking equipment be sanitized just prior to milking. Most dairies use a chlorine based sanitizer in lukewarm water (100 to 110 ^{o}F) for about a 5-minute cycle. This step can significantly reduce bacteria counts, particularly if there is more than one hour between milkings.

General Comments

Be sure that the air injector is operating properly throughout all four steps. The air injector admits atmospheric air into the milking system and creates turbulence in the liquid flow to provide a scrubbing action. Remember that you must wash or rinse the entire surface of the milking system. The turbulent flow of liquid created by the air injector ensures that the liquid comes in contact with all surfaces inside the pipeline as well as having the wash liquids hitting the receiver with enough force to wash the inside top and gasket of the milk receiver or milk vats.

An important safety consideration is to never mix acid and chlorinated compounds together because this mixture will release a hazardous gas that can cause lung damage and even death when inhaled. All materials used to clean and sanitize milking equipment can cause serious injury if splashed into the eyes or onto the skin. Always wear protective equipment and exercise extreme caution while working with these materials. It is important to safety train employees to prevent accidents, and ensure that safety protocols are being followed after the initial training.



'Rinse, Wash, Post-Rinse, and Sanitize' the milking equipment properly to aid in producing high quality milk on your farm.

Research Update: News about Milk Fat Composition

Alejandro Castillo, UCCE Merced

Milk is a complex food that has evolved to provide the complete range of essential nutrients and a wide variety of bioactive components for growth and well being of newborns.

On average, 96% of milk fat is composed of triglycerides. Milk fat contains a high proportion of saturated fatty acids and a lower proportion of unsaturated fatty acids. Saturated fat, is negatively associated with human health. In contrast, some

unsaturated fats are essential in the diet of humans because they cannot be made in our bodies and they are positively related to good health in many different ways.

Studies in the early 1990s with unsaturated fatty acids,(in particular a group called conjugated linoleic acids, or CLA), discovered that these fatty acids were potential agents to inhibit development of mammary tumors. Initially, and because of the high correlation between nutrition and milk fat content, these positive findings led to interest in dairy cattle nutrition as a way to alter the fatty acid profile of milk fat. There is a large body of scientific information available that describes how the diet of lactating dairy cows can impact the fatty acid composition of milk fat.

A study led by Prof. Juan Medrano (UC Davis, Department of Animal Science) with the support of dairy producers from Merced and Stanislaus Counties, was carried out to identify the genetic variation in genes related to the sterol regulatory element binding protein 1 (SREBP1) pathway that is responsible for milk fatty acid profiles in Holstein cattle.

The genetic knowledge generated in this study can now be combined with nutritional information to strategically develop management schemes to control milk fat content and explicitly guide the composition of saturated, monounsaturated, and polyunsaturated fatty acid levels in cow's milk, and examine problems associated with milk fat depression.

Reference: Rincón G, A. Islas-Trejo, A.R. Castillo, D.E. Bauman, B.J. German, and J.F. Medrano. Polymorphisms in genes in the SREBP1 signaling pathway and SCD are associated with 2 milk fatty acid composition in Holstein cattle. *Journal of Dairy Research* (accepted)

Farm Supervisor Seminar (in Spanish)

March 13-16, 2012
UCCE Stanislaus Office (rooms H & I)
Modesto, CA

Topics covered: Employee discipline, interpersonal negotiation skills, and the importance of praise in day-to-day communications. Those who attend will participate in numerous role-plays, and receive individualized attention and evaluation. A copy of the individualized participants' scorecard will be sent to each farm enterprise. Registration limited to two individuals per farm operation.

Seminar cost: Cost is $128 and includes materials and lunches over the four days. Those who register by January 31, 2012, can do so for $97. If sending a check, the envelope must be postmarked by January 31, 2012. Make checks out to UC Regents and mail to Workplace Mediation / c.o. G. Billikopf / 3800 Cornucopia Way Suite A, Modesto, CA 95358. If paying by credit card, go to http://ucce.ucdavis.edu/survey/survey.cfm?surveynumber=1763.

Contact: Gregorio Billikopf at gebillikopf@ucdavis.edu or 209-525-6800.

Dairy Heat Stress Road Show

April 6, 2012
University of California-Davis Veterinary Medicine Teaching and Research Center
18830 Rd. 112 - Tulare, CA

Speakers and topics: "Cooling strategies during heat stress" by Dr. Pete Hansen University of Florida, "Strategies to improve reproduction during summer" by Dr. Todd Bilby Texas A&M AgriLife Research and Extension, "Nutritional programs for the heat stressed herd" by Dr. Jose Santos University of Florida and "Economics of heat stress: Implications for management" by Dr. Albert DeVries University of Florida.

No preregistration is required. Participants will receive either English or Spanish proceedings at each program site. Proceedings and other web resources will be made available on DAIReXNET at http://www.extension.org/dairy%20cattle

For more information contact Noelia Silva-del-Río at nsilvadelrio@ucdavis.edu

Dairy Herdsman Short Course

April 17 - 19, 2012
University of California-Davis Veterinary Medicine Teaching and Research Center
18830 Rd. 112 - Tulare, CA

The purpose of the Short Course is to provide the people who do the actual work on the dairy the opportunity to receive information about the latest technology and training in all aspects of dairy management.

Registration fee is $280. Fees for companies and/or dairies with more than one participant will be $280 for the 1st participant and $260 thereafter. Students will be charged $220. Registration for individual days is also available. No registration at the door will be accepted. **There is translation for Spanish speaking attendees.**

To register on-line and pay by credit card: http://ucanr.org/2012herdsmanshortcourse

For more information contact Gerald Higginbotham, UCCE Dairy Advisor at (559) 675-7879, Ext 209.

Survey on the Role of Forage Testing in Markets

Drs. Dan Putnam, Ed DePeters and Peter Robinson at UC Davis
DEADLINE: NOVEMBER 14, 2011.

We would like to invite **all the nutritionists in California to fill this survey** on the role of forage testing (alfalfa, corn silage), with a focus on the feeding value and marketing of forage crops.

The survey is confidential. The answers will be summarized, but no participant will be identified. The results of this survey will be presented at the upcoming Western Alfalfa & Forage Conference to be held in Las Vegas, Nevada December 11-13, 2011. Respondents will receive a report of the results of the survey.

Please go to the following: http://ucce.ucdavis.edu/survey/survey.cfm?surveynumber=7453

Western Alfalfa & Forage Conference & Biofuels Workshop

December 11-13, 2011 - Las Vegas Hilton

The Western Alfalfa & Forage Conference is a comprehensive educational meeting for growers, industry members and interested parties, covering critical new areas for alfalfa, corn silage, and many other forages. The Conference will feature: A December 11 field tour, 35-40 expert speakers during the conference on December 12-13, a written proceedings, 40-60 exhibitors, and the opportunity to meet and greet with colleagues from the 11 western states, eastern and midwestern US, and from around the world. The Western Alfalfa & Forage Conference will be followed by the 'Biofuels in the West' Workshop on Tuesday afternoon.

Register at http://ucanr.org/sites/Alfalfa_Forages/Registration/
Lodging room block information at http://ucanr.org/sites/Alfalfa_Forages/Hotel_Information/

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Carol Collar, Farm Advisor