

December
2018

FORAGE

Midwest Forage Association

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Renew Your MFA Membership Today – for Free!

If joining the Midwest Forage Association were free, would you renew your membership today? Because membership in MFA *can be* free, but not many realize it. MFA is beginning its 16th membership drive. Every year since its inception, MFA has worked with its committed sponsors to offer coupons for discounts on everything from seed to equipment. If you take advantage of just one coupon, your membership in MFA is free since the minimum value of each coupon is \$50 - the price of MFA membership. In fact, most are valued at more than \$50, meaning you can actually *make* money by joining MFA.

Not only does MFA provide you with money-"making" coupons, it also provides the latest forage-related news, information, and research to help you become more profitable and efficient. It also offers valuable educational opportunities integral to improving forage management. MFA works closely with local, regional, and national forage industry leaders to provide the newest, most relevant information available in order to give you the tools needed to become better producers of forages. What else does MFA provide you ask? *It provides...*

Forage Industry Leadership

Whether through its popular educational events, which offer farmers the latest in forage-related information, or through MFA's membership in the National Alfalfa & Forage Alliance (NAFA), which focuses on enhancing public policy and programs for the benefit of forage farmers nationwide, MFA members are the beneficiaries of MFA's leadership within the forage community. Through these efforts, MFA continues to provide you with access and exposure to key industry leaders to enhance your knowledge of forages.

For the fifth year, NAFA was successful in securing funding for the Alfalfa Seed and Alfalfa Forage Systems Research Program (AFRP) which has provided nearly \$10 million in research funding. Who's getting this funding? Midwestern researchers have done well. Craig Sheaffer (UM), Kim Cassida (MSU), Dave Combs (UW), Brian Luck (UW), Mark Renz (UW), Dan Undersander (UW), Valentin Picasso (UW), Johanne Brunet (ARS), Deborah Samac (ARS), to name a few (visit alfalfa.org for a complete list and project objectives).

Additionally, NAFA established the first-ever alfalfa checkoff – U.S. Alfalfa Farmer Research Initiative (USAFRI), a farmer-funded investment in alfalfa-related research to help drive innovation and profitability in the alfalfa industry. Thus far, USAFRI has funded nearly \$750,000 in forage-related research projects (those too can be viewed at alfalfa.org).

Educational Opportunities

Two of the most valuable forage educational events in the region, the *Symposium* and *Tour de Forage*, are MFA's signature events holding an esteemed reputation within the industry.

FORAGE FOCUS

Thanks to our 2018 contributing authors – Forage Focus would not be possible without you!

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Special thanks to the Universities & USDA-ARS for serving as Contributing Editors!
North Dakota State University, University of Minnesota, University of Wisconsin, and USDA-ARS.

Together with the Wisconsin Custom Operators and the Professional Nutrient Applicators of Wisconsin, MFA hosts the *Symposium* at Chula Vista in Wisconsin Dells, easily MFA's most popular event. The two-day *Symposium* attracts nearly 500 participants and provides educational programming on topics MFA members identify as priorities (*see enclosed Symposium registration form for a 2019 agenda*). The event includes a dedicated trade show floor.

Tour de Forage, co-hosted with the University of Minnesota, is a multi-day educational event held in various communities across Minnesota and features presentations from some of the leading forage agronomists and researchers from across the region. The 2019 event will be held January 29-31 and will feature Kris Ringwall, Livestock and Forage Centre of Excellence, University of Saskatchewan, as its keynote speaker (*be sure to mark your calendar*).

Farmer-Driven Research

MFA's Midwest Forage Research Program (MFRP), begun in 2007, has now funded more than \$215,000 worth of forage-related research projects in North and South Dakota, Minnesota, and Wisconsin. The most important aspect of the MFRP is its farmer-driven structure. The program is designed to fund the types of projects farmers themselves view as priorities – those which will generate the most useful data and information to farmers. Project reports can be found in the Members Only Section of the MFA website (midwestforage.org).

MFA's Core Benefits

- **Forage Focus** – One of the most comprehensive forage magazines, MFA's signature publication is filled with current research, interviews, and forage-related news and information. Forage Focus is published March, May, August, and December. It includes information on: equipment, research, dairy, beef, corn silage, equine, hay, and grazing;
- **Clippings** – Emailed monthly, MFA's electronic newsletter includes time-sensitive news and information, sponsor and university perspectives, and a handy event calendar;
- **Website** – In addition to valuable forage-related news and information, MFA's website features a members-only area which includes an extensive database with results of MFA's MFRP research projects, and archives Forage Focus and Clippings articles;
- **Local Council Rebate** - \$5 of each membership goes back to support your local council;
- **Money Saving Coupons** – Each MFA membership includes a wide variety of money-saving coupons. If MFA members redeem just one of the valuable coupons offered by our generous sponsors they recoup the full cost of their membership.

All of these membership benefits are focused on providing you with the tools you need to continuously improve your forage-producing capabilities. But MFA cannot continue providing these important benefits without your help. Renewing your membership in MFA today will help provide the resources needed to continue bringing you the news and information you need to produce high-quality forages for years to come.

So make some money today! Take the time to renew your membership by calling 651.484.3888 or visiting MFA's website at www.midwestforage.org.

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A Path Toward Sustainable Management of Nitrogen in U.S. Dairy Production Systems

Josh Gamble, Gary Feyereisen, Deborah Samac, John Baker, USDA-ARS

Modern dairy farms are increasingly challenged to produce more and minimize off-site impacts of nitrogen (N) on air and water quality. To help meet these challenges, the dairy industry needs novel, low-cost, and easily implemented and maintained solutions for reducing N losses. However, this represents a significant challenge in a complex dairy system where N enters and leaves the production system through many pathways and in many forms and undergoes numerous transformations as it passes from feed to animal to milk or manure and back again. Research by the USDA-Agricultural Research Service (USDA-ARS) Dairy Agroecosystems Working Group (DAWG) seeks to develop bold innovations addressing these common regional and industry-wide challenges.

The USDA-ARS-DAWG is a multi-location research collaboration established in 2014 to support efforts to improve the productivity, competitiveness, and environmental sustainability of U.S. dairy farming systems. The group includes research teams focused on the major U.S. dairy-producing regions: the West (California, Idaho, Texas), Midwest (Minnesota, Wisconsin), and East (New York, Pennsylvania). As noted above, one of the major goals of the DAWG group is to develop new solutions to reduce N losses from U.S. dairy systems, focused mostly on nitrate (NO₃) leaching from soil, and nitrous oxide (N₂O) and ammonia (NH₃) greenhouse gas emissions from the field, barn, and manure handling. This overall goal is guided by the USDA-ARS Grand Challenge which calls for a transformation in U.S. agriculture resulting in a 20% increase in quality production with a 20% reduction in environmental resource impacts by 2025.

Thus far, research from DAWG members has provided insight into the scope of nutrient management concerns on dairy operations, including feeding strategies to better balance nutrients and improve dietary nutrient use efficiency; farmstead management to control greenhouse gas emissions and discharges of nutrients; and agronomic management to improve crop nutrient recovery, reduce environmental losses, and sequester carbon. The Minnesota DAWG group has focused on a collaboration with a large confinement dairy in west-central Minnesota to evaluate the environmental impacts of manured corn silage

Figure 1. Location of DAWG research teams & research projects.



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and alfalfa production on two adjacent fields. On-farm studies included evaluating: tile drainage N and phosphorus (P) losses from silage corn with and without a rye cover crop; sediment and P losses in tile drainage before and after replacing open surface tile inlets with fine gravel inlets; soil nitrate accumulation and tile drainage N losses with summer fertigation vs. fall injection of dairy manure; changes in soil organic carbon related to agronomic management and terrain; and long-term carbon balances of forage production systems.

In addition, the data collected from the on-farm collaboration was used to support whole-farm simulation modeling with all DAWG locations. The goal was to evaluate trade-offs among nutrient loss pathways for dairy operations and quantify key nutrient management challenges facing farmers across the country. Ten farms were

modeled, highlighting common dairy farming strategies, from the top seven milk-producing states (CA, WI, MN, ID, NY, PA, TX). Results were used to highlight current nutrient use inefficiencies on representative dairy farms and were published in the *Journal of Dairy Science*.

Moving forward, a central focus of the DAWG group is to develop a common experiment across all locations. Starting in 2017, multiple DAWG locations initiated the “manure priming study” with the objective of determining long-term effects (economic, environmental, soil chemical, biological, and physical) of a one-time or short-term manure application. The study idea originated at the USDA-ARS Northwest Irrigation and Soils Lab in Kimberly, ID, where researchers observed improved crop yields from plots that received manure nearly a decade ago, but now receive

only mineral fertilizer, compared to plots that only ever received mineral fertilizer. Their findings suggest even short-term or single manure applications can influence soil properties, and likely soil microbes, to the benefit of crops for years following application. However, the mechanisms responsible for this benefit are unknown. Quantifying the true benefits of manure to long-term soil health and crop production could enhance its value and improve economic feasibility of longer distance manure hauling. This will expand acreage available for land application, reduce the likelihood of overloading soils near livestock operations, and, therefore, reduce the risk of N and P losses. The manure priming study has been initiated at Kimberly, ID; and University Park, PA; and plans are in place to begin in Bushland, TX; Fort Collins, CO; Madison, WI; and St. Paul, MN. ☘



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Evaluating Forage Protein Before & After Calving Season

Eric Mousel, University of Minnesota

Roughage fed to cows during the winter is the primary source of dietary protein. Most roughage sources contain ample carbohydrate energy within their fiber cells to meet animal nutrient requirements. However, roughages with low-protein concentrations can be difficult for ruminants to digest. The microbes within the rumen break down the fiber cells of the roughage, allowing for the extraction of carbohydrate energy. These microbes, however, cannot use carbohydrates as food. Microbes require protein (aka: nitrogen) as their primary food source. When roughage is low on protein and high in fiber, the microbes within the rumen simply do not have enough food to function and reproduce efficiently. Therefore, digestion of the roughage within the rumen slows down considerably. When adequate roughage protein is available or is supplemented through alternative high-protein feeds, ample carbohydrate energy can be extracted from even the most fibrous, low-quality roughages with relatively high efficiency. Thus, dietary protein is the key nutrient ruminants need to digest roughage.

How much protein does a beef cow need? The first criteria to determine protein needs is cow size. Bigger animals need more total protein. Since bigger animals eat more, their diet protein concentration is less than smaller animals. The second criteria is cow production stage (Table 1). Protein requirements increase as pregnancy progresses and peaks during lactation; about a month after calving.

Table 1. Apx. CP concentration (% of daily diet) to meet nutrient requirements based on cow size (lbs BW) and production stage.

Cow Size (lbs)	Cow Production Stage		
	2 nd trimester (%)	3 rd trimester (%)	Lactation (%)
1,200	7.1	7.9	10.5
1,300	7.1	7.9	10.3
1,400	7.5	8.5	10.1
1,500	7.5	8.5	9.8

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Table 2. Example assuming we are feeding 30% corn silage, 60% corn stover, and 10% corn grain.

A	B	C	D	E	F	G	H
Feed ingredient	Formula	% CP (dry basis)	Moisture	Amount fed (DM) $Intake \times B$	Amount fed (in the bunk) $E/(100-D)$	Total protein consumed $E \times C$	Protein concentration in diet $G/Intake$
Corn Silage	30%	6%	65%	$35 \times .3 = 10.5$ lbs	$10.5/.35 = 30$ lbs	$10.5 \times .06 = 0.63$ lbs	
Corn Stover	60%	4%	15%	$35 \times .6 = 21.0$ lbs	$21.0/.85 = 25$ lbs	$21.0 \times .04 = 0.84$ lbs	
Corn Grain	10%	9.5%	10%	$35 \times .1 = 3.5$ lbs	$3.5/.9 = 4$ lbs	$3.5 \times .095 = 0.33$ lbs	
Diet Total						$0.63 + 0.84 + 0.33 = 1.8$ lbs	$1.8/35 = .05$ or 5%

Calculating dietary crude protein (CP) in the daily diet is key to making sure cattle are getting the feed to meet their needs. There are two components to formulating diets: intake (are they eating enough) and formulation (are they getting the right nutrients). A gestating beef cow eats ~2% of her body weight (BW) in dry matter (DM) per day. If we take her BW, 1,400 lbs X .02, she is going to eat ~28 lbs of DM feed per day. Once she has calved and starts lactating, she will eat $\leq 2.5\%$ of her BW per day, maybe more if it is really cold. Now, we can calculate how much protein she is getting. If fed a grass hay testing at 9% CP, take $28 \text{ lbs} \times .09 = 2.52$ lbs of CP. To calculate protein, take pounds of CP and divide by total amount of feed eaten ($2.52/28 = .09$). The CP concentration is 9%. Roughage is great for cows before calving, but after, use a better-quality roughage or feed a protein supplement (Table 1). This example is easy since we were using one feed ingredient. Let's look at a more complex diet. Assume a 1,400 lb cow that is lactating ($1,400 \text{ lbs} \times .025 = 35$ lbs DM daily). In Table 2, on the surface it seems as though we are feeding a nice diet, but in reality it is only ~5% protein, largely due to corn stover. So, replace some of the stover with a higher protein roughage or feed a supplemental protein.

Feeding a bred heifer uses the same concept, except protein requirements will be higher because not only is she growing a calf and milking, she is still growing herself. Table 3 shows the protein requirements of bred heifers.

When supplementing protein in your winter rations, which is more practical for some than buying better-quality hay, keep in mind not all proteins cost the same. Table 4 shows the cost per pound of CP in different supplemental protein sources.

Finally, it is important to test feed for quality. A good resource is: extensionpublications.unl.edu/assets/html/g331/build/g331.htm. ☞

Table 3. Apx. CP concentration (% of daily diet) to meet nutrient requirements based on bred heifer size (lbs body weight) and production stage.

Bred Heifer Size	Bred Heifer Production Stage		
	2 nd trimester (%)	3 rd trimester (%)	Lactation (%)
950 lbs	10.5	10.3	12.1
1,050 lbs	9.5	9.8	11.9
1,150 lbs	9.0	9.6	11.5

Table 4. Apx. cost per lb of CP of different supplemental protein sources.

A	B	C	D	E
Ingredient	CP (%)	Retail cost (\$/Ton)*	Total CP (lbs) 2,000 lbs x B	Cost per lb of CP (\$/lb) C/D
Mixed grass-legume	14	90	280	\$0.32
Alfalfa	18	110	360	\$0.30
Soybean meal	44	305	880	\$0.34
Dried distillers grain	30	130	600	\$0.21
Canola meal	35	235	700	\$0.33
Range cake	20	250	400	\$0.62
Lick tub	20	900	400	\$2.25

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Corn Silage Mycotoxin Management

Matt Akins, Damon Smith, University of Wisconsin-Madison

With the wet Midwest growing and harvesting season, there is a good likelihood of corn silage having mold contamination. Mold manifests from fungal infections that may have occurred in leaves, stalks, or ears. Multiple infections can occur on a plant and may or may not be related to one another. Depending on the type of organism involved in a particular infective event, there could be mycotoxins produced. However, visible mold doesn't mean there is going to be mycotoxin present and vice versa. Visual and laboratory identification of moldy growth can give an indication if mycotoxins may be present. However, testing is needed to determine if mycotoxins are present, which specific toxin you are dealing with, and the concentration of mycotoxin in feed.

Mycotoxins are secondary metabolites (not part of normal metabolism) produced by fungi that can be toxic to plants and/or animals. The cause of their production is not well-understood but it is thought stressors on the pathogen (possibly plant- or weather-related) trigger secondary metabolism resulting in mycotoxin development. Thus, there can be cases when moldy growth is visible and little mycotoxin is quantified, and other times when there are high levels with little or no visible moldy growth. The specific mycotoxins produced in silage feed are dictated by the fungal organism growing on corn plants. For example, aflatoxin is produced by *Aspergillus flavus* while deoxynivalenol (DON), fumonisin, and T-2 toxin are produced by *Fusarium* species. *Aspergillus sp.* generally proliferate during drought conditions and are usually not a significant concern in most years in the Upper Midwest. However, aflatoxin was identified in corn grain and feed in 2012, which was the last hot, dry Midwest summer. In 2018, *Fusarium sp.* were the fungi of primary concern, especially *Fusarium graminearum*. Use of fungicides may help manage fungal infections and lower corn silage mycotoxin levels. However, when weather conditions are highly favorable for fungal organisms, use of fungicides may not be successful.

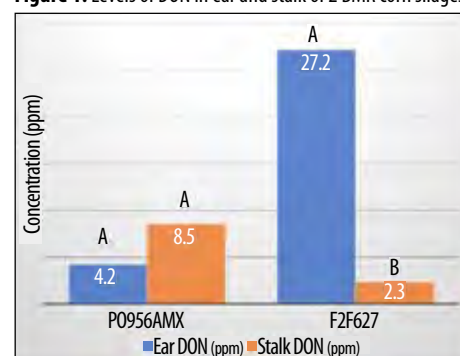
In 2018, Damon Smith's Field Crops Plant Pathology Lab established corn silage plots to evaluate the use of different fungicides at different growth stages (V6, V12, R1, and R2) on 2 BMR corn silage hybrids (PO956AMX; F2F627). Yield, forage quality, disease, and DON (or vomitoxin) were assessed in response to fungicide applications. Vomitoxin is produced by the fungus *Fusarium graminearum*, which causes Gibberella ear rot (photo) and also Gibberella crown and stalk rot. There was little fungicide effect

on corn silage yield or forage quality. Environmental conditions were favorable for fungal disease, with foliar and ear diseases relatively high compared to 2017. DON levels were high for all treatments (>7 ppm). For the PO956AMX hybrid, fungicide did not significantly affect DON levels. For F2F627, a few fungicide treatments/timing combinations had small effects on DON levels. Some products were consistent across the trial in giving some reduction relative to the non-treated control. These included Proline applied at R1, Delaro applied at R2, and Miravis Neo applied at V6. The R1 stage seems to be most effective for reducing subsequent mycotoxin levels. An interesting finding for the F2F627 hybrid was the ear had greater DON levels than the stalk, while PO956AMX had stalk DON levels twice as high as the ear, although not statistically significant (Figure 1). We then conducted some correlation analysis with several parameters. Ear DON levels were not significantly correlated with stalk DON. In fact, the relationship (not statistically significant) was actually negatively correlated, suggesting stalk DON levels and ear DON levels might be originating from independent events. Remember, *F. graminearum* can cause a stalk and crown rot and/or an ear rot. These different diseases can occur independent of each other. Thus, it is plausible that the stalk DON levels might be due to stalk infection and subsequent rot, not necessarily related to ear rot in corn. This study shows that fungicide application may help reduce mycotoxin levels, however, the levels may still be high due to environmental conditions favoring the fungus. A blog post with more detailed findings is at badgercropdoc.com/2018/10/12/2018-corn-silage-fungicide-trial-results-story-vomitoxin/.



Gibberella ear rot on corn.

Figure 1. Levels of DON in ear and stalk of 2 BMR corn silages.



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Testing of corn silage suspected to have mycotoxin contamination is necessary for making feeding decisions. Proper sampling is important as there is high variation of mycotoxins within the silo and across the silage face. Use of a silage facer to remove silage then mixing the silage using the loader or a TMR mixer will result in a more representative sample. Do not send a sample taken by spot-sampling the silage surface as it is not representative, nor it is a safe sampling technique. Refrigerate the sample prior to shipment or use cold-packs for shipment. It is suggested to work with a nutritionist to determine which toxins to test for and also to contact the analytical lab to determine which lab methods to use for specific toxins. Potentially harmful mycotoxin levels for livestock have been summarized by John Goeser of Rock River Laboratories (Mycotoxin Guidelines and Dietary Limits) with the dairy and feedlot limits shown in Table 1. To calculate total diet mycotoxin levels, use this equation: feed mycotoxin concentration x (lbs feed DM in diet/lbs total diet DM). It is important to note the differences in toxin concentration units (ppm or ppb) when interpreting lab results. If reported values are in different units, convert to the correct units. To convert ppb to ppm, move the decimal three places to the left (1000 ppb DON = 1.0 ppm DON). To convert ppm to ppb, move the decimal three places to the right (0.5 ppm aflatoxin = 500 ppb aflatoxin). With results in hand you can decide if actions are needed. Actions can include dilution with clean silage/feeds to reduce diet toxin levels or using a feed additive flow agent (clays; activated carbons; yeast cell wall extracts) that adsorbs toxins and allows passage of the toxin through the digestive tract with reduced animal effects. The primary action should be minimizing the level of toxin in the diet using available forages and feeds. Feed additives are not completely understood and have not been proven to work in all cases, as they may only bind certain toxins. Most work has focused on aflatoxins with hydrated sodium calcium aluminosilicate clays working well, however, these may not work for other toxins including DON. It appears activated carbons may be most effective against DON (Whitlow and Hagler, 2017). A feed additive with a combination of ingredients (clays, yeast cell wall, or activated carbons) may be most beneficial if aflatoxin is not present and one or more *Fusarium*-related toxins are present (Hoffman, et al., 2009), which is often the case when DON is present. Request research-based information on product efficacy. Each toxin can cause different toxicity symptoms (Table 1). Symptoms are often reduced feed intake and milk production, poor condition, or poor reproduction. These symptoms are general and also may be associated with other nutrition or management issues; thus, testing helps determine if mycotoxins are an issue.

Overall, use of fungicides and hybrids resistant to fungal infections may reduce fungal growth, visible mold, and mycotoxin production. Testing and silage management can further reduce effects on cattle if toxins are present. ☘

Table 1. Potentially harmful mycotoxin levels of the total diet dry matter (Summarized by John Goeser), favorable conditions for mycotoxins, and related toxicity symptoms (Adams, et al., 2016).

Toxin	Dairy	Feedlot	Favorable Conditions	Toxicity symptoms
Aflatoxin	20 ppb	20 ppb	Hot, dry conditions	Liver damage & reduced immune response; reduced intake & performance
DON or vomitoxin	0.5-1 ppm	10 ppm	Wet during pollination, then cool/wet at harvest	Low feed intake & production; possibly diarrhea
Fumonisin	2 ppm	7 ppm	Drought conditions followed by wet, cool conditions	Low feed intake & weight loss; liver damage
T-2 toxin	100 ppb	500 ppb	Wet & cool	Damage to digestive system; hemorrhaging; death
Zearalenone	400 ppb	5 ppm	Wet & cool	Similar structure to estrogen; causes udder & vulva swelling; possibly abortion
Ochratoxin	5 ppm	5 ppm	Improper storage conditions	Likely minimal effects as highly degraded in rumen

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The Impact of Tedding on Alfalfa Quality

Lindsey Murry, Matthew Digman, University of Wisconsin-River Falls

A five-acre research trial was conducted at the University of Wisconsin-River Falls Mann Valley Farm during the summer of 2018. This study evaluated the impact of tedding on the quality of alfalfa for silage production. We expected to see a higher-quality crop from tedding due to reduced drying time in the field, but could this increase in quality offset the cost of the added field operation?

Previous research has shown tedding results in an increased drying rate as it increases the cut-to-swath width ratio (CSR). Modern-day mowers have a CSR of ~50-70% at best performance, meaning a 12' mower will result in a swath width of ~6-8'. By tedding, the crop is spread out creating a nearly 100% CSR. The sun's full potential is used to dry the crop, causing an increased drying rate. From the increased drying rate, it would be expected there would be reduced losses due to cellular respiration, causing a higher quality end product.

The field trial was replicated over the first three alfalfa cuttings in May, June, and July. Prior to cutting, pre-harvest samples were collected to serve as a quality base value. Then the field was cut and split into four sections, two tedded and two un-tedded, to minimize variability. After designating sections, tedded sections were immediately tedded and un-tedded sections were left in original swaths. The next day, the field was harvested and quality samples were taken from each section (average quality characteristics over the first three cuttings are summarized in Table). The ideal quality characteristics are lower NDF, ash, and CP with higher water-soluble carbohydrates (WSC) and TDN. Tedding the crop resulted in slightly lower CP, higher NDF and WSC, and lower ash content. However, little practical significance would be attributed to these results. In addition, a decision tool was developed for farmers to understand the impact tedding has on final product cost. This tool is set up so the user can calibrate it to their operation. The user can search the current database of equipment and tractors or add their own. The cost per hour, acre, and ton are automatically calculated. Lastly, the user can run multiple scenarios where they can mix and match equipment to compare the entire cost of the operation in total cost per hour, acre, and ton. For most operations, the cost of the additional operation would not outweigh the small increase in quality we found. However, an additional factor not easily quantified is the reduced risk on the crop due to a rainfall event.

While tedding may not fit every operation, it expedites making high-quality silage with minimal forage quality impact. The question will be whether the advantage can be taken given your operation. ☞

Figure 1. Summary of quality data from three cuttings of alfalfa, half of each cutting was tedded and half swathed.

Cost Scenario	Return to Homepage		Try Another Scenario		
	Selected Implement	Implement Type	Cost Per Hour	Cost Per Acre	Cost Per Ton
	GF 10812T	Tedder	\$136.27	\$11.34	\$11.34
	Combo 8830D and 3125	Triple Mower	\$319.24	\$17.26	\$17.26
	KUHN MM 700	Merger	\$180.33	\$15.50	\$15.50
	John Deere 640C (Medium SPFH)	Windrow Pickup	\$285.17	\$35.60	\$35.60
	TOTALS:		\$921.01	\$79.70	\$79.70

Table 1. Summary of quality data from three cuttings of alfalfa, half of each cutting was tedded and half swathed.

Treatment	Moisture (%)	CP (%)	NDF (%)	WSC (%)	Ash (%)	TDN (%)
Tedded	51%	21.1	39.5	7.3	10.2	65.9
Un-tedded	62%	21.7	38.7	6.5	11.0	65.9
P-value	<0.05	<0.05	<0.05	<0.05	<0.05	N.S.



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Don't Let Hay Storage Losses Rob You This Winter

Jared Goplen, University of Minnesota-Extension

A lot of time and energy is spent putting up quality hay, which can be wasted without proper hay storage. Up to 50% losses in dry matter (DM) and quality can occur in some instances – the equivalent of leaving half of your hay acres unharvested. Prevent unnecessary hay losses in the next year by: making dense bales of dry (<20%) hay; stacking hay so it does not trap moisture; improving storage pad drainage; and considering buildings, tarps, or bale wraps to keep hay covered. Even small changes can have large impacts on hay storage losses, forage quality, and profitability.

Hay has the same enemy in the field as it does in storage – moisture. Preventing moisture contact with bales should be a top priority. Moisture enters hay from the top and bottom, from rainfall as well as wicking up from the soil. Keeping hay off of the ground and under a structure prevents the majority of moisture problems. Hay properly stored should only lose 2-5% of DM over several years of storage. If hay gets wet, however, microbes come to life. Those microbes start eating away at the hay, which leads to DM losses and deterioration in quality. The simultaneous loss of DM and forage quality decreases hay value. In just 8 months, losses in forage quality and DM can reduce hay value by more than \$30/ton. Whether your hay is stored indoors or not, evaluate the ground your hay is stored on. If you are storing it on poorly drained soil such as sod or black soil, water will wick up. Hay that is dry at harvest can increase to >30% moisture through wicking. This level of moisture can cause spoilage and DM losses >20% even over a short period of time. Losses may approach 50% if stored for more than one year. Storing hay on a well-drained surface such as gravel, rock, or old tires or pallets to keep hay out of contact with the soil should minimize DM losses to <15%.

If hay must be stored outside, a number of small changes can minimize storage losses. Square bales will be fine outside if you cover them and elevate them off the ground. Round bales are a better option if you do not cover the hay, as they shed water better. Tightly rolled round bales shed water best. If you can push into the side of the bale <math>< \frac{1}{2}</math> inch, then the bale should be tight enough to shed water well. Net-wrapping improves the ability for bales to shed moisture, resulting in 32% less DM losses compared to twine bales. If twine is used, spacing bales <math>< 6</math> inches apart will improve their ability to shed water.

Making larger bales means a greater percentage of the hay is protected inside the bale. The outer several inches of a bale tend to have the greatest spoilage, meaning larger bales help minimize storage losses outdoors. The outer 2 inches of a 4-foot bale contain 16% of the bale's DM, while just 11% of DM is contained in the outer 2 inches of a 6-foot bale.

Another hay storage consideration is stacking method. Pyramid stacking of round bales should be avoided if bales are left uncovered. This traps moisture and causes the largest DM losses. End-to-end stacking, so bale ends are touching, is the best choice for outdoor bale storage. Leaving 3-5 feet between rows of bales allows water a place to go and air movement between the bales. A north-south orientation of bales is best, as it permits more uniform sunlight to reach bales. This is especially the case if bales are stored through summer months.

If you need to preserve high-quality hay and have little tolerance for losses, consider covering bales stored outside. Covering bales can reduce DM losses by an additional 6% or more compared to storing on a well-drained pad. Depending on the quality of hay, it could be well-worth the hassle and extra work of covering hay outside with plastic or tarps. Another option is to use one of the newer bale-covering technologies such as bale sleeves or bale wraps. These may be more realistic alternatives compared to covering with a tarp, and can minimize losses so they are more similar to that of indoor storage.

To minimize your hay storage losses – do everything you can to keep hay dry. Even small changes can minimize storage losses and allow you to preserve high-quality hay. ☘



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Silage Too Wet or Dry? What Can We Do?

Eugene Rodberg, Kemin Industries

Making perfect silage is always the goal. Silage fermentation is the best way to preserve the nutritional value of forage crops. And, in many cases, fermentation can actually improve digestibility of high fiber crops.¹

The problem with making perfect silage – it is not always possible. Every farmer has experienced silage which was too wet or silage which was too dry. Too dry and the fermentation is not complete. Too wet and clostridial growth can result in the sour smell of butyric acid. Proper silage management can prevent many problems with silage, but what can farmers do when weather conditions will not cooperate? Is there anything we can do once silage, specifically alfalfa silage, has turned sour?

Forage is too wet

We need to identify what causes the formation of butyric acid smell in silage. Alfalfa that is ensiled too wet undergoes a fermentation dominated by clostridia.² This is often because the forage is harvested too wet for the type of storage facility. Rain events in the field after mowing also increase the chance for clostridial growth because rain leaches soluble sugars from the forage.

The obvious solution to this situation is to ensile all forages at the correct dry matter (DM) content for the storage facility. Proper packing to a minimum density of 15 lbs DM/ft³ excludes oxygen from the silage mass. Another way to help reduce the number of bacteria incorporated in the silage is to reduce the amount of soil or manure picked up with the forage.

There are several additives which have been used by farmers to control the growth of bacteria in wet forages. Organic acids, specifically formic and propionic acid, have been shown to exhibit selective

antibacterial action.³ Combinations of organic acids, or organic acid blends, have been shown over the years to provide control of fungi, specifically mold and wild yeast strains. Less well researched is the control of bacteria by organic acids in silage. However, farmers report good results related to improved fermentation of wet forages with an addition of 2-4 lbs of blended organic acid per ton of forage.

Forage is too dry

At the other extreme, farmers are often faced with forages which are too dry. Harvesting high-DM forages can result in poor packing which leaves too much oxygen in the silage mass, leading to poor fermentation and heating of the forage. This poor fermentation means higher DM loss, greater risk of spoilage, and short bunk life during feed out.

Another risk with low-moisture corn silage is reduced starch and fiber digestibility. Dry corn kernels are too hard and pass through the cow undigested. To compensate for the dry kernels, operators can adjust the kernel processor to break the kernels to enhance digestibility.

There are several excellent guides online to help with managing dry forages. Bruce Anderson, extension forage specialist in the state of Nebraska, offers some excellent tips for handling dry corn silage.⁴

One practice farmers use with dry silage is to add water. This is often not a very practical way to raise the moisture of silage. Anderson writes, “Adding water to increase moisture content is next to impossible. It takes about 7 gallons of water for each ton of silage to raise moisture content just one point. Even if you have enough water, the chopped corn can't absorb it fast enough to do any good.”⁴

The goal with dry silage, and all silage for that matter, is to minimize oxygen. To help dry silage pack better, a common

practice is to shorten its chop length. This is accomplished by adjusting chopper knives to cut finer. At the same time, adding extra packing weight to the silage pile will help ensure a better packing of the silage. The rule of thumb for packing tractor weight is the rule of 800; have 800 lbs of tractor weight for every ton of silage delivered to the bunker each hour. If you are delivering 100 tons/hour, you need 80,000 lbs or 40 tons of packing tractor on the silage pile.

Another option is to blend wetter feed with the dry feed. Blending wet forages like fresh alfalfa, green chop, forage sorghum or green soybean can add enough moisture to enhance the fermentation. Proper blending of dry forage with wet forage is critical to ensure hot spots do not develop in the silage.

As with wet forage, there are additives which can help with dry forage. With dry silage, if we can control the growth of mold and wild yeast, we can provide a favorable environment for the growth of lactic acid-producing bacteria. Organic acid blends with propionic and acetic acid have been shown to help reduce the level of fungi in feed. By applying 2-4 lbs of blended organic acid per ton of forage, we can control the growth of non-beneficial organisms and create a favorable environment for beneficial bacteria to grow.

Summary

We all try to put up perfect silage. However, everything from the weather to breakdowns to over-scheduled custom operators conspire to ruin our plans. Over the years, farmers have developed ways to make bad situations better. The use of blended organic acids has been a valuable way for farmers to make wet or dry silages into better-quality feed. These additives have a long track record of success in helping to make silage better. ☞

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Feedbunk Overstocking Effects on Growth Performance

Wayne Coblentz, USDA-ARS; Matt Akins, University of Wisconsin-Madison

Use of corn silage in the diets of pregnant dairy heifers offered for ad-libitum intake can be problematic for several reasons. First, corn silage exceeds the energy requirement for this livestock class. Secondly, concentrations of structural plant fiber (NDF) are too low, and voluntary intake is not limited adequately through the normal gut fill process. As a result, heifers often gain excessive weight, which can affect mammary development negatively, as well as first-lactation performance. One remedy is to dilute total mixed rations (TMR) with low-energy forages, such as straw; however, heifers often exhibit aggressive sorting behaviors discriminating against these less-desirable forages. This can be a problem if smaller or passive animals are prevented from reaching the feedbunk until after substantial sorting has occurred. Recently, this has been examined by USDA-ARS and UW scientists at the UW Marshfield Agricultural Research Station.

Design. Sixteen pens of pregnant Holstein dairy heifers (8 heifers/pen) were grouped by weight and offered a diet for 91 days consisting of 54% alfalfa haylage, 21% corn silage, and 25% chopped wheat straw (49.2% NDF, 12.6% CP, 11.1% starch, and 59.0% TDN). All pen groups received the identical diet, but feeding restrictions were put in place so that 0, 2, 3, or 4 head-locking feed gates were covered. This created effective stocking rates at the feedbunk of 100, 133, 160,

and 200%, respectively. It is important to note overcrowding was implemented only at the feedbunk; each heifer always had access to a freestall, and there was 114 ft² of pen area per heifer within each identical pen. Feeding management was consistent with UW recommendations for using straw in TMR diets, which includes feeding daily to a minimal amount of refusal. The diet was offered at 10:00 a.m. daily, and feed was pushed up within easy reach of the heifers 5 times during the next 24 hours.

Feedbunk Displacements. During weeks 1, 2, 4, 6, 8, 10, and 12 of the trial, observers monitored heifer behavior in each pen, recording the number of displacements during the first hour after feed was distributed. There was little evidence of aggressive behaviors after the first hour following feed delivery, and observations were then discontinued. Not surprisingly, displacements increased (linearly) with feedbunk stocking rate, and increased from ~16 to 61 displacements/hour between the 100 and 200% stocking rates (Figure 1).

Sorting Behaviors. Feedbunks were sampled at 1:00, 4:00, 7:00, and 10:00 p.m., as well as 1:00, 6:00, and 8:30 a.m. the next morning. Samples were evaluated for particle-size distribution with the Penn State Particle Separator to assess daily feedbunk sorting trends. Sorting behaviors were not affected by stocking rate. Concentration of large particles (>19 mm) increased by 80% during the day, indicating

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Figure 1. Total displacements per pen from the feedbunk during the first hour after feed delivery as affected by feedbunk stocking rate. Displacements increased linearly with feedbunk stocking rate.

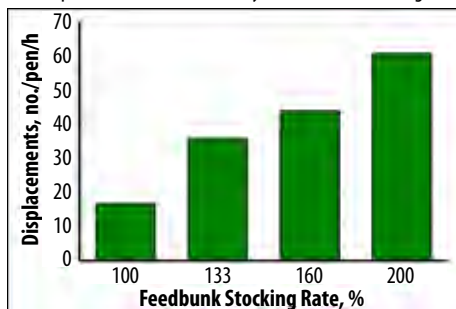


Figure 2. Concentrations of large particles (>19 mm) remaining in the feedbunk during the 24-hour period following feed distribution.

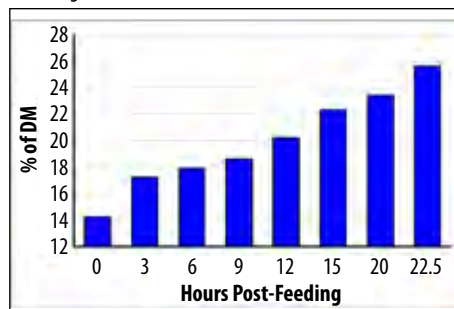
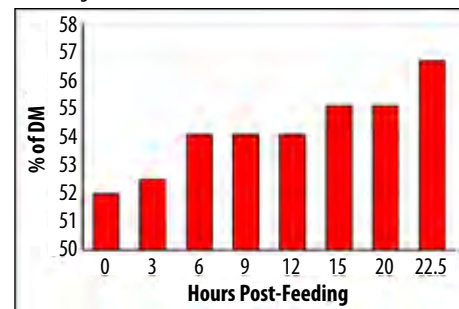


Figure 3. Concentrations of NDF within the TMR remaining in the feedbunk during the 24-hour period following feed distribution.



strong discrimination by heifers (Figure 2); however, concentration of medium particles (>8 mm, <19 mm) did not change. Heifers displayed a modest preference for short particles, and a strong preference for fine particles, whose final concentration was only 60% of that in the original TMR. Discrimination against large particles was associated with greater NDF, which increased by ~10% during the day (Figure 3).

Heifer Performance. Despite the differences in displacements from the feedbunk and the predictable overall sorting behaviors by heifers, feedbunk stocking rate did not exhibit any detectable effect on heifer growth performance. Average daily gains from the 100, 133, 160, and 200% feedbunk stocking rates were 2.14, 2.25, 2.25, and 2.36 lbs/day, but these rates of gain did not differ statistically (overall mean = 2.25 lbs/day). In addition, variation in daily gains within pens were not clearly affected by stocking density. There were statistical tendencies for more efficient feed:gain ratios with elevated stocking rates compared to pens with an available headlock for each heifer (10.3 vs. 11.0 lbs feed/lb gain). Body measurements and condition scores were not affected by feedbunk stocking rate.

Summary. It may be surprising to report that crowding heifers at the feedbunk had no effect on growth performance; in fact, if anything, there was some suggestion that weight gains were improved by this type of crowding, although it could not be confirmed statistically. To properly interpret these results, it is important to remember that other aspects of animal care were maintained at very high standards. These standards included adequate pen area and numbers of freestalls, regular manure removal, frequent push-up of remaining feed, and minimization of the variability for pre-trial body weights within each pen. Although heifer growth performance was not affected by feedbunk stocking rate in this trial, it should not be inferred that it can be practiced blindly, without attention to other aspects of animal care. ☞


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Grazing Crabgrass

Aubrey Jaqueth, University of Minnesota

Crabgrass is typically viewed as a weed which invades lawns and pastures and is difficult to control, but this may be changing. There are now crabgrass forage varieties commercially available that may be of use to livestock and horse managers. Crabgrass is a warm-season annual grass and comes in many varieties, but two most common are smooth crabgrass (*Digitaria ischaemum*), and large crabgrass (*Digitaria sanguinalis*) sometimes referred to as “hairy crabgrass.” Smooth crabgrass is most often seen in lawns, as it is a low-growing grass which tolerates traffic and close mowing. It has an advantage of producing nodes which take root when they come in contact with soil, allowing for a growth pattern similar to bermudagrass and zoysia grass which spread by stolons. This physical trait also allows for smooth crabgrass to act as a soil anchor, giving it an advantage to surviving in erosion-prone areas. Large crabgrass is much larger and has an elongated stem with multiple leaves on each stem. It grows upward as opposed to outward. This is most similar to forage varieties commercially available. In 1988, the Nobel Foundation released its first forage crabgrass, ‘Red River’, followed by the release of ‘Quick-N-Big’ in 2006 from Elstel Farm and Seeds.

‘Red River’ and ‘Quick-N-Big’ are suitable for use in the southeastern portion of the U.S., from Nebraska to the east coast and south. Both have demonstrated high yield potential and have been successfully grazed by cattle and horses. When comparing the two, ‘Quick-N-Big’ can produce ~10% more forage than ‘Red River’, but previous reports have shown yields as high as 12,000 lbs or more of dry weight yield per acre for both varieties. Not only do forage-type

crabgrasses produce high yields, they are also high in nutritional quality. Quality does vary with management, but crude protein has been reported to range 12-25% on a dry matter basis. Palatability is good for cattle and horses, despite the “stemmy” appearance of mature plants. Average daily gains for beef cattle grazing the two varieties have ranged 1.8-2.5 lbs per day.

Recently, a study was conducted where ‘Red River’ crabgrass was grazed by horses. Results showed ‘Red River’ was preferred compared to varieties of bermudagrass,



Grazing Red River crabgrass (plot in foreground) and three other bermudagrass cultivars at the Virginia Tech Mare Center in a collaborative project with the University of Maryland.

but it is unclear if this is due to nutritional differences or to growth pattern differences. It had a tendency to grow upward but also develops runners if space allows, whereas bermudagrass exhibited stolonous growth radiating outward in a horizontal pattern.

Establishing crabgrass is relatively simple. It should be seeded at 1-5 lbs/ac, depending on goals. As compared to other forages, crabgrass establishes more successfully with aged seed than with new seed. Soil pH can be 5.5-7.5 and soil should be lightly tilled and compacted prior to seeding. It can be broadcast onto

the seedbed or applied by no-till drill at ¼-½" deep, maximum. When broadcasting, it should be rolled, assuring good seed-to-soil contact. Under good conditions, seed should germinate quickly and forage can be grazed or harvested as soon as 40 days from emergence. It responds well to nitrogen, but can be prone to accumulating high nitrate levels. Currently, it is recommended to split nitrogen applications so that no more than 50-60 lbs/ac are applied at a time. When controlling weeds in crabgrass pastures, 2,4-D can be applied, as it will be most effective against broadleaves. If you wish to control crabgrass itself, multiple pre-emergent and post-emergent products are available; but be advised not all products are labeled for on-farm use and grazing restrictions may apply.

For many livestock and equine managers, perennial cool-season grasses such as tall fescue, orchardgrass, and Kentucky Bluegrass are popular grazing forages. They only need to be seeded once, and if properly managed, can produce a viable grazing option for years to come. Their disadvantage is they experience a summer production decline when temperatures increase, and they require more time to establish compared to warm-season annual grasses, such as crabgrass. By supplementing pastures with forage crabgrass, you can ensure abundant forage throughout the summer. It will need to be seeded every year, or the field will need to be rested at the end of the summer and into early fall, allowing it to enter a reproductive state and drop seeds for the next season. In addition, it can be a useful emergency forage if hay fields and pastures suffer winter damage. In a pasture, supplementing animals with hay can be minimized as crabgrass is ready to graze sooner than freshly seeded perennial grasses. ☞

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SOUTH DAKOTA– New Alfalfa Trial for Northeast South Dakota

Karla Hernandez, South Dakota State University

A new alfalfa trial was developed and planted on June 7, 2018, at the Northeast Research Farm near South Shore, SD. This project is in collaboration with Valent U.S.A in Sioux Falls, SD. Two 20'x50' plots, side by side, were used to evaluate yield production with treated and non-treated Roundup Ready® Alfalfa. This was a randomized complete block design (RCBD) with 5 replicates in each plot. The treated-alfalfa main component was an endo-granular mycorrhizae. No cuttings were performed during the establishment year. Yield and quality will be evaluated in 2019.



New alfalfa plots after planting at Northeast Research Farm.

Advantages of mycorrhizae in alfalfa:

1. Allows plants to draw more nutrients/water from soil, including P.
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6. Enhances flowering.
7. Offers better yield production.
8. Reduces soil erosion.



Roundup Ready Alfalfa growth at the Northeast Research Farm.

MINNESOTA– Profitable Conservation: Corn Production in Kura Clover Living Mulch

Jonathan Alexander¹, Jeff Coulter¹, John Baker^{1,2}, Rodney Venterea^{1,2}; ¹University of Minnesota, ²USDA-ARS

Conventional row crop rotations can be challenged by wet conditions at planting and unfavorable markets. Companion cropping may offer greater flexibility for farmers with diverse production demands. Kura clover is a persistent perennial legume forage crop that can be used as a living mulch in corn and soybean production. Its vigorous spring growth and spring management enriches soil with organic nitrogen (N) that is broken down and later used by the growing cash crop, reducing N fertilizer needs. Kura clover-row crop companion systems offer the ability to produce high-quality forage, silage, or grain and stover, in combinations that rapidly respond to farmer and market demands. An N rate study



for corn after kura clover forage, and corn after corn in kura clover living mulch, was conducted in east-central MN in 2017 and 2018. Corn was fertilized with a split-application of SuperU (urea with microbial inhibitors to reduce risk

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Besides a higher yield, the consistent increase in protein & RFV impresses me the most! E. Koester, Oakview Dairy, Tulare, CA

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of N losses) from 0 to 220 lbs N/ac, with 40 lbs N/ac applied at planting and the remainder at the four-leaf stage. In 2017, for corn after kura clover forage, corn grain and stover yields (193 bu/ac and 2.3 tons DM/ac, respectively) were not increased with applied N. For corn after corn, only 105 lbs N/ac was needed to maximize grain and stover yields (197 bu/ac and 2.6 tons DM/ac, respectively). These yields are comparable to those attainable with conventional production and N fertilizer rates and indicate kura clover living mulch can provide substantial amounts of fixed N to corn. Findings suggest kura clover living mulch can reduce fertilizer cost while maintaining high corn yield and providing additional income from corn stover. In this system, kura clover living mulch regrows in the spring and contributes organic matter to soils while protecting against erosion. Possibilities of this cropping system are revealing themselves. Future research could soon investigate optimum rotation management to realize the full economic and environmental potential of kura clover living mulch.

WISCONSIN—Students Training & Preparing to Enter the Work Force Through Applied Research

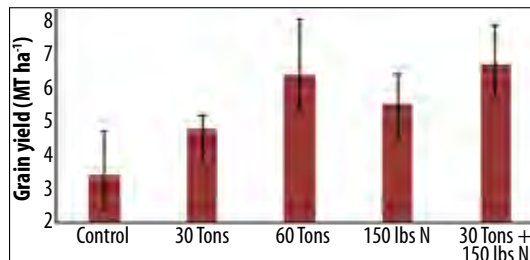
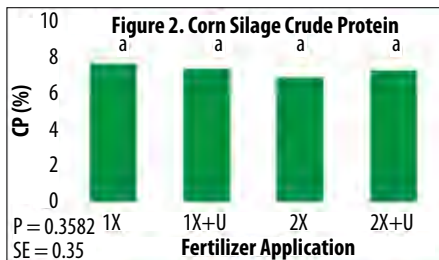
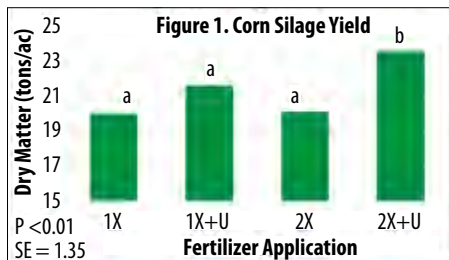
Yoana Newman, Natasha Macnack, University of Wisconsin-River Falls

A second year of research on farmers real issues continues with funds from an AFRP (USDA NIFA) grant, providing an opportunity for UW-River Falls students to conduct applied research. Many dairy farms use manure and an inorganic nitrogen (N) fertilizer routinely without knowing the cost benefits or added nutritive value. Knowing this can improve management of these resources. Following are selections from ongoing projects:

Forage evaluation & nutritive value – year 2 of fertilizer source effect on corn silage nutritive value. Results from 2018 support the previous year’s conclusion showing high applications of manure (60 tons/ac) may not be necessary to increase CP, but the low rate (30 tons/ac) tested plus urea (110 lbs/ac) can help farmers make economical and environmentally friendly decisions on fertilizer applications that can still maximize their silage output.

Dairy manure effect on soil fertility & soil health. Research has included many studies: evaluating variability of corn growth and yield response as a function of split-applied N; effect of manure on soil health and fertility; and, evaluating effects of spent grain and brewery waste water on corn growth and yield. In our study evaluating effect of dairy manure on soil health and fertility, soil samples were collected pre-plant and one week before harvest. We included 5 treatments: control (0 manure/0 N); 30 tons/ac of applied manure; 60 tons/ac manure; 150 lbs N/ac applied as urea (46-0-0); and 150 lbs of N and 30 tons of manure per acre. Results showed the treatment with 30 tons and 150 lbs N per acre had the highest yield. This treatment also had the most CO₂ flux increase (data not shown). Conclusion – higher rates of manure and manure w/inorganic N have the most benefits to soil health and fertility in comparison to inorganic N alone.

Figures 1 & 2. Year 2 evaluation of corn silage yield & CP as affected by 30 tons/ac (1x) manure application and 60 tons/ac (2x) manure application with and without 110 lbs urea/ac.



These projects were conducted with the help of UWRF undergrad students Jordyn Bush, Barrent Herman, April Lake, Michael Langan, Kendra Letch, Derek Lenzen, William Lenzen, Melissa Preston, Carl Snyder, and Allison Vasey.

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Amino Acid Profiles in Cool-Season Grass, Alfalfa & Teff & How They Could Affect Horse Health

Michelle DeBoer, University of Wisconsin-River Falls; Marcia Hathaway, Craig Sheaffer, Kerry Kuhle, Krishona Martinson, University of Minnesota; Patty Weber, Michigan State University

Summary

Despite lower forage amino acid and higher fiber concentrations in teff compared to cool-season grasses (CSG) and alfalfa, minimal plasma amino acid differences were observed in grazing horses. This suggests sufficient amino acid availability and digestibility existed in all forage types regardless of forage protein differences.

Introduction

Forage is an important component of the equine diet, with horses primarily consuming CSG, legumes, or warm-season grasses in the form of pasture or hay. However, these different forage types vary widely in their nutritional content. One main difference across forage types is their protein content, with the highest values often observed in legumes, such as alfalfa, and the lowest values observed in warm-season grasses, such as teff. Protein is an important component in the equine diet as it facilitates growth as well as muscle maintenance and repair. While crude protein (CP) is commonly used to estimate protein content, amino acids are a more accurate measure of protein quality. However, the amino acid profiles of different forage types are rarely reported.

How Our Research Was Conducted

To determine the amino acid profile of three different forage types and the corresponding plasma amino acid response in grazing horses, six aged horses grazed CSG (Kentucky bluegrass and orchardgrass mixture), legumes (alfalfa), and warm-season grass (teff) pastures in July 2016. Forage samples and blood samples were taken prior to pasture turn-out and two and four hours following turn-out. Forage was analyzed for the nutrient content and amino acid profile while plasma was collected from the blood samples and analyzed for the amino acid concentration.

Table 1. The nutrient content and essential amino acid profile of forage grazed by horses in July 2019.

Nutrient	Alfalfa	CSG	Teff
DE, Mcal kg ⁻¹	2.37	2.22	2.01
CP, % DM	23.3	24.1	15.4
NDF, % DM	43.2	53.4	65.0
ADF, % DM	33.1	30.9	37.0
Amino Acid, % DM			
Arginine	0.89	1.07	0.57
Cystine	0.22	0.25	0.14
Histidine	0.43	0.43	0.23
Isoleucine	0.95	1.01	0.58
Leucine	1.57	1.75	1.02
Lysine	1.17	1.25	0.72
Methionine	0.33	0.41	0.24
Phenylalanine	1.02	1.18	0.65
Threonine	0.81	0.92	0.51
Tryptophan	0.28	0.30	0.15
Tyrosine	0.57	0.61	0.33
Valine	1.16	1.28	0.74



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Results & Discussions

Forage Nutrient Content. All nutritive values differed across forage species during the grazing period (Table 1). Alfalfa and CSG had higher digestible energy (DE) and crude protein (CP) compared to teff. In comparison, neutral detergent fiber (NDF) and acid detergent fiber (ADF) were highest in teff compared to the other species. While higher CP values are associated with higher amino acid concentrations, fiber content is important, as it can play a role in the availability of amino acids. The lower CP and higher fiber observed in teff suggests there are fewer amino acids present in this forage with decreased availability to horses.

Forage Amino Acid Profile. To further evaluate protein, amino acid profiles were evaluated (Table 1). Concentrations of amino acids in forages were often highest in CSG and lowest in teff with moderate values observed in alfalfa. Despite these differences, the lysine amino acid concentration in the current study was compared to lysine requirements of different classes of horses. Most, with the exception of growing horses and pregnant mares, would meet their lysine requirements when consuming teff pasture at 1.5% dry matter (DM) of their body weight. As a result, it appears the forage amino acid differences may not be problematic on a physiological level.

Plasma Amino Acid Concentrations. Regardless of treatment, fasting amino acid levels (hour 0) remained the same for all horses, and acted as a baseline value. While most plasma amino acid concentrations were not different regardless of the forage type being grazed, plasma threonine did exhibit differences after four hours of grazing (Figure 1). Horses grazing CSG had higher plasma threonine concentrations than horses grazing teff. Results suggest threonine could be a limiting amino acid in horses grazing teff.

Conclusion

Cool-season grasses and alfalfa had higher amino acid concentrations; however, the only difference in plasma was decreased threonine concentrations in horses grazing teff. While higher protein and lower fiber concentrations were observed in CSG and alfalfa, it appears horses grazing teff have a similar plasma amino acid response. ☞

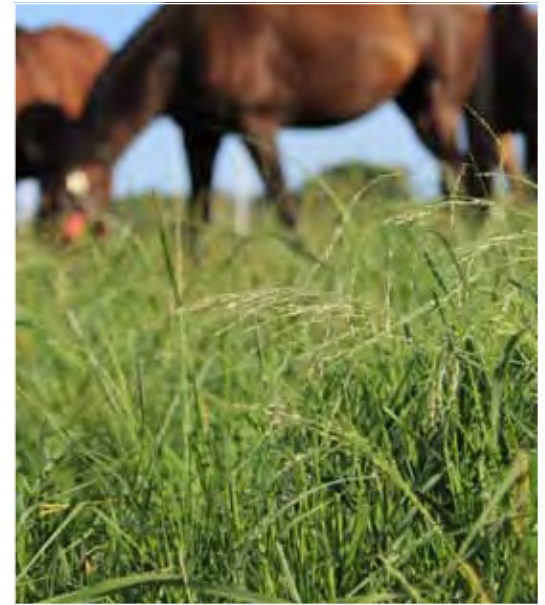
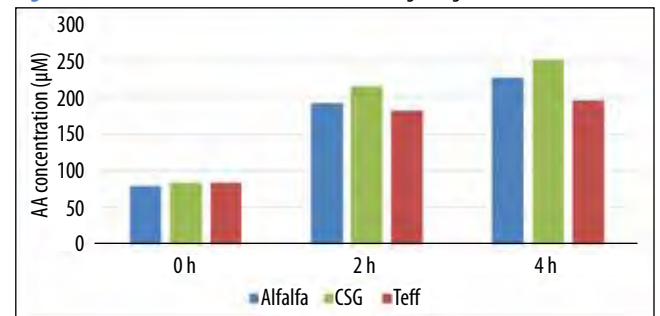


Figure 1. Plasma threonine concentrations in horses grazing alfalfa, CSG, and teff.



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Family at the Core of Balzer Dairy

Rick Balzer knew from a very early age that he wanted to be a dairy farmer. Having spent his whole life on a farm, it was clear there was only one logical career path for him. “I’ve farmed my whole life,” Rick said. “I even wrote an essay in 9th grade about how I was going to be a dairy farmer someday.”

Rick’s parents, Lawrence and Arlene, bought the farm near Owatonna, MN, in 1949. After one year of vocational school in Austin, MN, Rick returned to the farm in 1979 to farm with his dad. Rick and his younger brother, Doug, started a partnership in 1984, purchasing their dad’s cows and machinery. Then in 1992, Rick bought out his brother and started farming with his own family.

Today, Rick, Cathy (his wife of 38 years), and their son Scott, farm 500 acres of black loam soils on which they grow a mixture of corn, soybeans, alfalfa, and grass mixtures. Scott is the third generation to farm on Balzer Dairy. Scott joined the farm in 2009 after graduating from the University of Wisconsin–River Falls with a dairy science degree and working for one year on a dairy farm in Wisconsin. The Balzers also have three other sons, Ross, Reid, and Brandon, who help out when needed.

In addition to their 500 acres, the Balzers are kept busy maintaining a herd of 150 dry and milking Holsteins. Rick also feeds heifers, fixes equipment, and does fieldwork. Cathy feeds calves, is the bookkeeper, and beds the cows. Scott feeds cows and does the mechanical and field work. There’s always plenty of work to go around. The Balzer family must be doing something right as they were recognized as the 2013 Steele County Farm Family of the Year. “It was an unexpected honor,” said Rick. “It’s nice to be recognized for your hard work and something you love doing.”

A typical rotation on the Balzer farm is five to seven years of corn, one year of soybeans, one year of oats, and two years of alfalfa. “We rotate out of alfalfa after two years no matter how good or bad the stand is because it’s so good for the corn the following year,” said Balzer. For his hay stands, Rick generally uses a mixture of 15 lbs alfalfa, 2 lbs clover, and 5 lbs of premium blend from Byron Seed. “We’ll take four cuttings a year with the last one around early October since we need the extra feed.” They cut their hay with a 1432 New Holland mower conditioner with an extra deflector which lays the hay over the entire length-of-cut for quick drying. Hay is cut in the morning, merged a few hours later, and then chopped when it reaches about 58% moisture.



Rick and Cathy Balzer along with their son, Scott, are pictured with the award they received as the 2013 Steele County Farm Family of the Year.

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After milking in a tie stall barn for years, the Balzers were interested in transitioning to a robotic milking parlor. They visited a lot of farms and did a lot of research, ultimately deciding to go “all in.” In August of 2015, they built a new freestall barn and purchased two Lely Astronaut A4 robotic milkers. Fittingly, they named the robots “Rick” and “Cathy” in an homage to themselves in recognition of the many years the two of them milked cows in their old 103 tie stall barn. The robotic milkers have made milking much more productive, much more efficient, and much easier. It is designed to minimize milking times, improve udder health, and reduce udder stress.

The cows have full access to the robotic milker and enter at their own free will. The incentive for entering the milker is the feed. Each cow has an ID tag that is scanned, telling the machine exactly how much feed to dispense. If a cow enters the milker too soon after it has been milked, it is gently rejected. Since the Balzers have transitioned from a tie stall barn to the robotic milkers they’ve seen roughly a 30% increase in milk production, going from 62 lbs/cow/day to 82 lbs/cow/day.

The data generated with the robotic milkers is valuable as well. They can see the number of lactations, days pregnant, milk production, milk speed, vaccinations, as well as certain health issues. All of the data can be sorted into handy reports.

The barn also utilizes a state-of-the-art ventilation system with polycarbonate siding and no curtains. The fans were installed at a discount after the Balzers agreed to be a research facility for the company. The air exchange in the building is approximately four times per hour in the winter and up to 60 times per hour in the summer depending on the temperature and humidity. “The end result is fresher air for the cows and cooler temperatures in the summer,” said Rick.

The best part of farming, according to Rick, is it’s a family activity. “This is definitely a family affair. I really enjoy that aspect of farming,” he said. They are beginning to plan for the next generation. While Scott is there already, others might get the itch to return to the farm.

If there is one valuable lesson Rick would share with other farmers it would be the benefits of using fungicide on corn. “I tried it three years in a row and gained 3 tons/ac doing so. It’s well worth the trouble.”

The Balzers have been dedicated MFA members since it began in 2004. “The most valuable part of MFA membership is the new ideas I read about. Learning about what other farmers are doing or what research is being done is extremely valuable to our operation.” ☘



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Fond du Lac County Forage Council Dairy Forage Day

Thursday, December 20; 11:00 a.m. • UW-Fond du Lac, Fond du Lac, WI

Calumet County Forage Day

Friday, February 1; 10:00 a.m. • Neighborhood Pub & Grill, Brant, WI

Waupaca County Forage Council Winter Meeting

Thursday, February 14; 10:00 a.m. • Bear Lake Resort, Manawa, WI

Outagamie Forage Council Annual Meeting

Thursday, February 21; 9:30 a.m. • Doxbee's, Seymour, WI

Shawano County Forage Council Annual Meeting

Thursday, February 21; 10:15 a.m. • The Main Event, Cecil, WI



Minnesota Local Council Affiliates

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- East Central Forage Council**
Dick LeCocq • lazybranch@ncis.com • 320.679.5755
- Northeast MN Forage & Grassland Council**
Troy Salzer • salze003@umn.edu • 218.384.3511
- St. Croix Valley Forage & Grassland Council**
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- Southeast Minnesota Forage Council**
Dan Miller • dan@danbmiller.com • 507.259.6270
- Southwest Minnesota Forage Council**

Wisconsin Local Council Affiliates

- Calumet County Forage Council**
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- Central Wisconsin Forage Council**
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- Chippewa Valley Forage Council**
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Wisconsin Local Council Affiliates (cont.)

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- Fond du Lac County Forage Council**
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- Manitowoc County Forage Council**
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- Outagamie County Forage Council**
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- Portage County Forage Council**
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- Shawano County Forage Council**
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- Sheboygan County Forage Council**
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- Waupaca County Forage Council**
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If your county would like to get involved, contact the MFA office, 651.484.3888.