

FARM REPORT



In This Issue:

Beware of the Black Swan	2
How to Choose Oral Electrolyte Solutions	3
Stories that Stick With You	4
Environmental Enrichment	5
Choosing Corn Hybrids	6
Dealing with High Grain Prices	7



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FROM THE PRESIDENT’S DESK: ALFALFA AND CORN SILAGE COMBOS

With economic, environmental, and even social considerations encouraging the use of higher fiber, higher forage diets we may need to take a fresh look at how we use alfalfa in ration formulation. Alfalfa has unquestionable benefits for soil health, nitrogen fixation, and sustainability of forage systems. Yet alfalfa hay production declined by 75% between 1982 and 2012, while corn silage production increased by about a third.

In many ways corn silage and alfalfa are complementary forages. The fiber characteristics of alfalfa, high crude protein content, and its solubility plus higher lysine - all these attributes match up well with corn silage’s fermentable starch content. The net result of an optimal combination of these two forages ought to be a positive effect on rumen microbial protein synthesis and solids-corrected milk production.

We recently wrapped up a study designed to see if we could successfully feed more alfalfa in lactating dairy cow diets. And just as importantly, to determine if there is a benefit to feeding more alfalfa. We used 105 high-producing cows from our Institute herd and for four weeks fed them one of five diets containing 62% forage in the dry matter. The forage consisted of a blend of chopped, high quality alfalfa hay (21.7% CP, 34% aNDFom) and corn silage (9% CP, 37.4%

aNDFom) in rations of 10:90 corn silage to alfalfa hay, 30:70, 50:50, 70:30, and 90:10 (all on a DM basis). The rations were fed as TMR, and water was added to the higher hay diets to keep ration DM at about 60% or less.

The higher hay diets also had smaller particle size given how the alfalfa fragmented when chopped. We intended to have all the diets supply similar metabolizable protein, but in the end the highest alfalfa diet supplied about 150 grams/day more vs. the highest corn silage diet. As expected, the diet lysine content also increased as alfalfa inclusion increased.

Despite the challenges of using hay versus silage, the alfalfa hay made a great nutritional model because we were able to purchase a uniform supply that lasted the entire study. Also, work some years ago at the US Dairy-Forage Research Center by Glen Broderick showed that alfalfa hay and silage can elicit similar lactational responses.

So, what did we observe? Cows on all five diets averaged 59 lb/day of dry matter intake and 106 lb/day of energy-corrected milk. Observing this same high production across a wide range of alfalfa-to-corn silage ratios allows us wide latitude in the amount of

See **SILAGE**, Page 5

BEWARE OF THE BLACK SWAN

A “black swan” is an unpredictable event with potentially catastrophic consequences, which may be a fair description of 2022. High fertilizer prices, herbicide shortages and badly clogged supply chains make this a year of challenges for crop production. Following are four items that may need your attention.

1. Farmers have a lot to think about this spring as they consider what to do with their grass-alfalfa fields (less than 50% alfalfa), a decision which may be influenced by the uniformity of the alfalfa in the field. The decision would be easier if alfalfa would die off uniformly, leaving a similar amount of alfalfa throughout the field. But what you’ll probably find are parts of the field where the alfalfa is still going strong while in other places it’s long-gone. It’s probably not practical to fertilize the various areas separately, so your decision would be to not apply any nitrogen, or to apply it across the entire field. We got good results at Miner Institute by applying 40-50 lbs. of N/acre — equivalent to 100 lbs. of urea — to our grass-alfalfa fields. As we’ve noted before, nitrogen will not harm your alfalfa and may slightly increase its yield, but with N around a buck a pound don’t apply N to fields with over 50% alfalfa: Stay off these fields until first cut, then after the first crop is off apply 0-0-60 at a rate determined by soil
2. Straight grass fields need N as soon as you can get on the field after the grass breaks winter dormancy. High soybean meal prices will make home-grown protein a premium in 2022. Miner Institute research found that 100 lbs. of N per acre at spring green-up doubled grass yields and increased crude protein from 12% to 18%. But what if 100 lbs. of N costs about \$100? UAN32 is slightly more efficient than urea but costs about a dime more per pound of N. It’s still worth fertilizing your good grass fields with N, but perhaps back off to about 70 lbs. of N. I have no research data supporting this lower rate, perhaps just my tightfisted Yankee upbringing. (And that’s a Connecticut Yankee, not the New York Yankees...) Topdressing grass fields with liquid or slurry manure is an option, but not if it means rutting up your fields — especially those you want to maintain as grass. (Our experience is that long-established reed canarygrass fields are less likely to be rutted up by heavy equipment.) You also need to consider what else you could be doing instead of the time-consuming process of spreading
3. Some fertilizer retailers are (understandably) scared of taking on a big inventory of high-priced fertilizers in case prices decline; some are only buying enough to satisfy confirmed or prepaid orders. Therefore, it’s important to work closely with your fertilizer dealer, and this year don’t assume that you’ll be able to buy whatever you want whenever you need it.
4. If you ordered Roundup-Ready corn or soybean seed make sure that either you or your custom spray applicator have enough glyphosate. (And “have” means actual possession of the herbicide.) We don’t know what the situation will be by the time you head for your fields this spring, but the 2022 supply situation for this crucial herbicide — the most widely used one in the world — is shaky at best. The question doesn’t seem to be whether there will be a glyphosate shortage but how severe it will be. The shortage has been made worse by recent manufacturing problems at a U.S. glyphosate production plant. And for glyphosate coming in from China (its leading manufacturer), the Northeast is a very long way from the California Ports of Entry, which continue to have about 100 container ships sitting offshore waiting to be offloaded.

— *Ev Thomas*
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SAVE THE DATE!

Miner Institute is hosting an Open House on Aug. 6, 2022!

Stay tuned for more information!

HOW TO CHOOSE ORAL ELECTROLYTE SOLUTIONS AND WHEN TO USE ONE

Oral electrolyte solutions (OES) are a fantastic way to support the metabolic and rehydration of calves with diarrhea. Calves with diarrhea often experience metabolic acidosis from a combination of low sodium, increased acid (excess fermentation in the forestomach or intestines), and loss of bicarbonate from the intestines. This can lead the calves to becoming depressed, have low suckle reflex, impaired coordination, recumbency, coma, and eventually death. However, metabolic acidosis is not necessarily correlated with degree of dehydration. The method used to correct fluid status of the calf should be based on degree of hydration, suckle reflex, and ability to stand according to Dr. Peter Constable, University of Illinois. He recommends that calves that are able to suckle and are <6% dehydrated, which can be indicated by a 3 mm eye recession, can be administered OES.

Selecting the OES to use is an important part of correcting hydration and metabolic acidosis. Not all OES are created equal! The key pieces of selecting the electrolyte solution are the osmolality, sodium concentration, alkalizing agent, and the energy content. Typically, the target osmolality is less than 500 mOsm/L, sodium 90-130 mmol/L, alkalizing agents including bicarbonate, acetate, and propionate, and glucose that is 2-3 g/kg of bodyweight. The energy provided by OES is not sufficient to support the energy needs of the calf so it is recommended to continue to feed milk or milk replacer. Furthermore, it is often recommended to not feed an OES close to when calves are offered milk or milk replacer because it can change the osmolality of that meal in the stomach of the calf and interfere with milk clot formation. Additionally, the alkalizing agent in the OES solution can raise the abomasal pH for longer after that meal.

This is important because the low pH in the abomasum acts to kill bacteria that the calf may consume. However, timing of OES administration can be a logistical challenge to accomplish on farm, as this would require it to be fed several hours after regular feedings.

An interesting paper recently published in the Journal of Dairy Science (105:1542-1554) evaluated different alkalizing agents in combination with the timing of feeding OES relative to milk replacer feeding. The alkalizing agents used to correct acidosis are typically either sodium bicarbonate, acetate, or propionate. In this study they evaluated bicarbonate and acetate. The second part of this study was understanding the timing of OES administration in proximity to a milk or milk replacer feeding. Therefore, the four treatments evaluated in this study were 1) OES with acetate, 2) OES with bicarbonate, 3) milk replacer + OES with acetate, and 4) milk replacer + OES with bicarbonate. The calves on the milk replacer diets were fed that 30 mins before being offered the respective OES, while calves fed only the OES were not fed milk replacer. The researchers evaluated abomasal emptying rate, ex vivo bacteria growth potential, and abomasal pH of the calves.

Calves fed only the bicarbonate OES had the highest max pH but for a shorter period of time compared to calves fed milk replacer and OES where the pH remained higher for a longer period of time. Calves fed acetate OES had the lowest max pH and time spent with an elevated abomasal pH. The pH of the abomasum is important because of the bactericidal effect. Acetate is metabolized in the liver whereas bicarbonate acts in the abomasum, which is likely why the pH was increased for a longer time for calves fed bicarbonate OES. When the authors evaluated the bactericidal effect of the fluid collected from the abomasum

of calves fed the different treatments they observed that calves fed the acetate OES had the lowest growth of E. coli, intermediate for milk replacer and acetate OES, and highest for calves fed the bicarbonate OES, either alone or with milk replacer. The emptying rate was fastest for calves fed only acetate OES.

Overall, feeding milk replacer and OES had an increased pH for a longer period of time that likely gave E. coli the opportunity to grow compared to when only the OES was given. In general acetate OES had the shortest amount of time and lowest peak of when pH was increased, giving less opportunity for bacterial proliferation while correcting metabolic acidosis. This would be in line with recommendations from others that acetate is the best alkalizing agent to include in OES. One limitation of this study is that they did not have a control where only milk replacer was fed. Therefore, it is difficult to determine how much more time pH is elevated when milk replacer is fed with OES. Other research has indicated that after milk or milk replacer feedings pH is elevated for ~20% of the day whereas when an OES is fed in combination that increases to ~35% of the day. Any ability to reduce this time would be beneficial in reducing the risk of further microbial challenge.

If you're looking for electrolytes or want to evaluate the one you're currently using, check the tag or ask for more information about the alkalizing agent used. Acetate is the preferred substrate. Using oral electrolyte solutions is a fantastic way to keep calves hydrated when they have diarrhea. Continue to feed milk replacer to the calf, and if possible offset the time that electrolytes are offered.

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STORIES THAT STICK WITH YOU

Some things you hear can be remembered for a very long time. One example is from about 30 years ago, as told to me by a Cornell University agronomy professor. At the time Cornell had a commercial soil testing lab, testing many thousands of samples each year. The professor was talking to a dairy farmer who in passing mentioned that in recent years the Cornell lab must have made some changes in its soil testing procedures. There hadn't been any changes, so the prof asked how the farmer knew this. "It's simple. I've always sent my soil samples to the Cornell lab, and I always do the sampling myself so no change there. For many years I've had about the same size dairy herd and the same acres of cropland. And I haven't made any big changes in cropping, about the same acreage of corn and hay crops. But in spite of this, in the past couple

years I've noticed that my soil test P and K numbers have been increasing. Nothing has changed on my farm, so it's gotta be the lab."

This puzzled the professor, especially since the farmer insisted that the changes in soil fertility were real — a benefit of careful sampling and using the same lab every year. So he asked: "Are you sure that *nothing* has changed in your cropping program?" "Yes, nothing except that I had a manure pit dug a few years ago and instead of spreading every day I'm now storing the manure and spreading the slurry with a tank spreader. But I have the same size dairy herd so the same amount of manure going onto the same acreage."

Aha! The professor, being a bright fellow (as are all Cornell University

professors of course) quickly realized what had happened. He asked the farmer what type of manure spreader he was using when he had been daily spreading. And sure enough it was a tailgate spreader, some of which are notorious for leaking manure from a poorly-fitting tailgate. We've all seen those brown trails along farm roads. But more importantly, and regardless of the equipment used, daily spreading meant spreading manure on snow and on frozen ground, greatly increasing nutrient losses in surface runoff. By using a manure pit which eliminated the need for winter spreading, more of the manure nutrients stayed where they were put. And this difference was enough that over a several-year period it was visible to the farmer via the increases in his soil test values.

— E.T.

THE DISMAL SCIENCE

The title of this article is a term coined by Scottish historian Thomas Carlyle to describe the discipline of economics. It was inspired by the prediction by Thomas Malthus, an 18th century English economist, that global population would always grow faster than food production, dooming mankind to unending poverty and hardship. (That certainly qualifies as a dismal prediction.) However, the percentage of global population in famine declined from 15% in 2000-2004 to less than 9% in 2019. In 2021, in spite of the ravages of Coronavirus-19, it was still less than 10%. Malnourished children under the age of 5 declined from 33% in 2000 to 21% in 2019. Taking a longer view, since 1990 the number of undernourished people in the world has declined by 50%, which is the opposite of what Malthus predicted. The wealthiest nations with the greatest food security have the lowest fertility rates, whereas the most food-insecure countries have the highest fertility rates. On a related topic, the 2021 Census found that in the past year the U.S. population grew by less than 400,000 or 0.1%, which is the lowest percentage increase in U.S. history. During the 10 years 2010-2019 the average annual growth was 0.66%.

— E.T.

Is there something you would like to know more about? Email article suggestions to Rachel at dutil@whminer.com



ENVIRONMENTAL ENRICHMENT

In last month's *Farm Report* Rick discussed what the effect of providing a loafing area in barns could have on cow behavior. A recent study found that when cows were given access to a loafing area, they displayed an increase in active behaviors such as social activity, estrus, and grooming. A follow up question was brought to light: What would be the effect of adding other enrichment into indoor housing, such as toys for cows or calves to play with?

The March 2016 issue of the *Journal of Dairy Science* included a review that looked at the environmental enrichment of dairy cows and calves housed indoors. In this study, enrichment was defined as "an improvement in the biological functioning of confined animals resulting from modifications to their environment." Adding forms of enrichment to dairy pens allows animals to express natural behaviors such as grooming, eating, resting, and ruminating, and can reduce abnormal behaviors such as weaving, pacing, and tongue-rolling. This review discussed how improving an animal's environment may affect its overall health and well-being.

The five categories of enrichment discussed were: social, occupational, physical, sensory, and nutritional. Physical enrichment involves adding items to the environment that would allow the animal to display grooming or play behavior. Having brushes in cow pens can have a positive impact by allowing them to display natural grooming behavior. It keeps them clean and allows them to scratch parts of their body they otherwise would be unable to reach. What about toys? Zoo animals often have balls and other toys in their habitat that they play with, so there is no reason to believe that cows wouldn't play with them as well if provided. There is little research that shows what the impact would be if toys were added to pens to encourage play behavior in cows. However, some research on calves has shown that hanging balls and brushes in calf pens encourages play behavior, which is associated with improved welfare.

This review included a study that was done in 2009, where manila (fiber) ropes were hung in a feed lot. The researchers found that, after a few days of adjustment, the cattle nibbled and licked the rope daily. Calves and

heifers interacted with the rope more than mature cows did. The nature of the motivation for the cattle to engage in this behavior was not investigated, but the reviewers believed that based on this research, hanging ropes in pens could increase physical enrichment. If you add something new to a cow's environment, they will likely show interest in it since they tend to be curious creatures. For example, last summer I was on an open lot dairy in Idaho putting up a camera at the headlocks to assess feed availability. I probably used half a roll of duct tape to keep the camera in place, yet as I reviewed the footage, what did I find? Within the first two hours of the camera being put up, a Jersey cow licked it out of place.

Adding enrichment to an animal's environment may allow them to cope with stress and better meet their behavioral needs. With the large number of animals housed indoors around the world, it's important to continue to research ways to improve their environment and increase overall animal welfare.

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SILAGE, Continued from Page 1

alfalfa that can be fed relative to corn silage. When we dug deeper into the data, we found that the 30:70 and 50:50 alfalfa-to-corn silage diets resulted in the greatest milk true protein output and slightly higher de novo fatty acid content in the milk fat. The MUN content was lowest with the 30:70 diet as well. Overall, these milk compositional results suggested to us that an optimal proportion of alfalfa-to-corn silage,

under our ration formulations conditions, was about 30:70 to around 50:50.

The take-home message is: 1) alfalfa has substantial agronomic benefits, 2) our research shows that you can feed up to 90% of forage as alfalfa with corn silage in 62% forage diets, 3) milk components appear to be optimized between 30:70 and 50:50 alfalfa-to-corn silage, and 4) sustainable dairy-forage programs could

include higher alfalfa:corn silage ratios than is commonly used in the dairy industry today.

We'll be presenting the full results of this research at this summer's ADSA conference in Kansas City, so stay tuned!

— Rick Grant
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CHOOSING CORN HYBRIDS - AS RISKY AS INVESTING?

Farming is a risky business. U.S. farmers spend well over ten billion dollars each year to plant the nation's corn crop, all in the hopes that drought, disease, frost, hail or something else doesn't ruin it before harvest. If thinking about that doesn't give you anxiety, just add commodity price variability and storage factors into the mix. Fortunately, there are many opportunities to reduce the risks of crop production with insurance, derivatives, and other methods. While these risk management options certainly have their place, they don't offer as much peace of mind to dairy producers who grow corn for silage: if you have a crop failure, the cows still need something to eat. Ruminants must always have a source of high-quality fiber to support peak milk production.

When it comes to risk management, a foundational principle is to "Never put all your eggs in one basket." This is as true for selecting corn hybrids as it is for investing in the stock market. It doesn't matter what hybrid you select; if your forage program relies on a single set of corn genetics, you are at risk. A farmer once told me that he went out to harvest his corn one year, and the hybrid he planted decided to drop its ears on the ground as he was chopping it. Let's just say that he had a few choice words for his seed rep that year. In a case like this, a stroke of bad luck with a single corn hybrid could ruin the yield and quality of your entire crop. The simple solution is to grow multiple hybrids.

The performance of a corn hybrid is difficult to predict. My observation is that in most hybrid trials the winner one year almost never wins the next year. The results are variable even between years with similar weather patterns. By planting several of the best hybrids for your area, you'll maximize your chances of having a top performer in your fields. You can plant corn with defensive traits, such as disease resistance and drought tolerance, in the toughest areas to grow corn on your farm. On the other end of the spectrum, more vulnerable corn hybrids should be targeted to low-stress growing conditions (e.g. first year cornfields). Offensive yield traits, such as ear flex capability, should also be planted in highly productive environments because these traits will allow the corn to take full advantage of optimal growing conditions.

Using the brown midrib (BMR) gene can increase your chances of ending up with desirable forage quality. BMR plants are consistently higher in digestibility than their non-BMR counterparts in the same environment. The caveat is that BMR hybrids tend to be more sensitive to stress and "risky" from a yield standpoint. We usually plant a little less than half of our acreage to BMR at Miner Institute. This has allowed us to manage both yield and quality risks in our forage program and target the BMR corn to our highest producing cows.

A final consideration for risk

management in your forage program is to leverage different corn maturities. My research has shown that later maturing varieties are higher yielding even when harvested on the wet side. However, the resulting silage will be higher in fiber content than an earlier hybrid at optimal maturity. Thus, including both early and late corn can reduce yield and quality risks in a forage program. A strategy like this has the added benefit of spreading out corn development during the growing season. This is an advantage because heat and drought stress at the wrong time can have serious consequences on kernel set and starch fill. Different maturity groups will also add flexibility to your planting schedule in the spring. It's always nice to have that early hybrid ready to go if planting gets delayed for some reason (more on corn planting timing in next month's edition).

You may not think of your corn crop as an investment, but it certainly is. The cost of fertility, land rent, corn seed, and everything else is all put in place with the expectation of a return: a return that feeds your livestock and fills your bulk tank. Just like any risk game, there are plenty of strategies out there to "hedge your bets" – so choose your corn hybrids wisely. It may take a bit of planning and experimentation, but a well thought out corn hybrid portfolio is sure to pay dividends in the long run.

— Allen Wilder
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DEALING WITH HIGH GRAIN PRICES

The war in Ukraine is having a significant negative impact on dairy farm economics. It's unlikely that farm milk prices will rise enough to compensate for the price dairy farmers will be paying for feed grains and crop inputs this year. Any prices mentioned in this article would be out of date by the time you're reading this: Wheat prices are up the limit one day, down the limit the next, but the trend is up, and by a lot. 2022 soybean meal and corn prices (based on average futures prices) are up moderately from last year but 35% and 75% higher respectively than in 2020.

High grain prices puts an even greater importance on home-grown protein and energy. Farmers can have an immediate impact on this by fine-tuning their crop management. Two priorities: **First**, mow first cut forages when alfalfa is in the late bud stage, and when grasses are in the boot stage. These are the "sweet spots" combining yield and quality. Every day of delay past this reduces the crude protein content and digestibility of the forage. **Second**, have tillage and planting equipment ready so that corn planting can begin on the first day fields are ready, and plant corn hybrids that will reliably mature to 33-35% whole plant DM for silage harvest. Every additional percentage point of crude protein in forage crops, and every additional percentage point of starch in corn silage, means that much less soybean meal and corn that will have to be purchased.

— E.T.

Science Saturday - April 2, 2022

Science Saturday is an opportunity for students in middle school and high school who are interested in science to come and learn about career opportunities and programs in the biology, chemistry, and earth and environmental science departments at SUNY Plattsburgh. The program is a collaboration between Miner Institute and SUNY Plattsburgh.

Pre-registration is encouraged. <https://forms.gle/SikARXbAcrvBJdwe6>



SCIENCE SATURDAY
APRIL 2, 2022 10 AM - 1 PM

MINER INSTITUTE
RESEARCH EDUCATION DEMONSTRATION

STATE UNIVERSITY OF NEW YORK
PLATTSBURGH

Learn about careers in science!
Faculty from Miner Institute and SUNY Plattsburgh's chemistry, biology, and environmental science departments will be showcasing what they do!
Join us at the Joseph C. Burke Education & Research Center,
586 Ridge Road in Chazy
Contact Rachel for more info:
dutil@whminer.com or 518-846-7121, ext. 115



This fantastic team of North Country leaders kissed Miner Institute Holstein "Alice" and helped to raise more than \$8,300 for youth mental health and suicide prevention initiatives through the United Way of the Adirondack Region and its partner agencies.

Closing Comment

Even crime wouldn't pay if the government ran it.

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