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Application of Starch Degradability on the Farm

Dr. Charles J. Sniffen, PhD, Fencrest, LLC (Holderness, NH)

Starch degradability is a rapidly evolving story with interest stemming from work done by Dr. Allen at Michigan State in high producing cows. Additionally, work at Wisconsin on vitreousness and on prolamin proteins in corn has highlighted the differences among corn silage hybrids and different sources of corn grain. For years, we have focused on grain and silage yields per acre. Doing so, we have been able to achieve very high forage and grain yields but have ignored the nutrient characteristics of the corn we are growing. Many years ago Dr. Mike Allen (Michigan State) pointed out the importance of considering fiber digestibility, which in time has been accepted and in recent years have been incorporated into selecting and growing silage-only hybrids. However, until recently we have still largely ignored the availability of starch in various hybrids.

Most US hybrids have been developed for export with harder grains that needed to stand up to a lot of handling without breaking down. These hybrids tend to be more vitreous. Unfortunately, the starch availability from these grain sources is lower, mostly in the rumen but also whole tract.

The main prolamin protein in corn is zein, which is poor in quality hydrophobic protein. Prolamin proteins are a large family of plant proteins, some of which are poor quality proteins, only soluble in ethanol solutions. Because of this insolubility, they are poorly digested in the rumen and in the small intestine. As corn grain matures, zein protein develops and results in the starch granules becoming inaccessible by rumen bacteria. As the DM of corn silage goes much over 30%, starch degradability decreases. This again is due to the increase in the zein content of the kernel. However, over time in an acid medium, zein becomes soluble and the starches will become more available. The increased soluble protein as a % DM reflects the slow breakdown of the prolamin proteins, mainly zein, with time in the silo.



The genetic background, floury vs. vitreous, can greatly affect starch digestibility in both flint and dent corn. As vitreousness increases starch digestibility decreases which is shown clearly in the work done by Philippeau and Michalet-Doreau and the chart below (middle right).

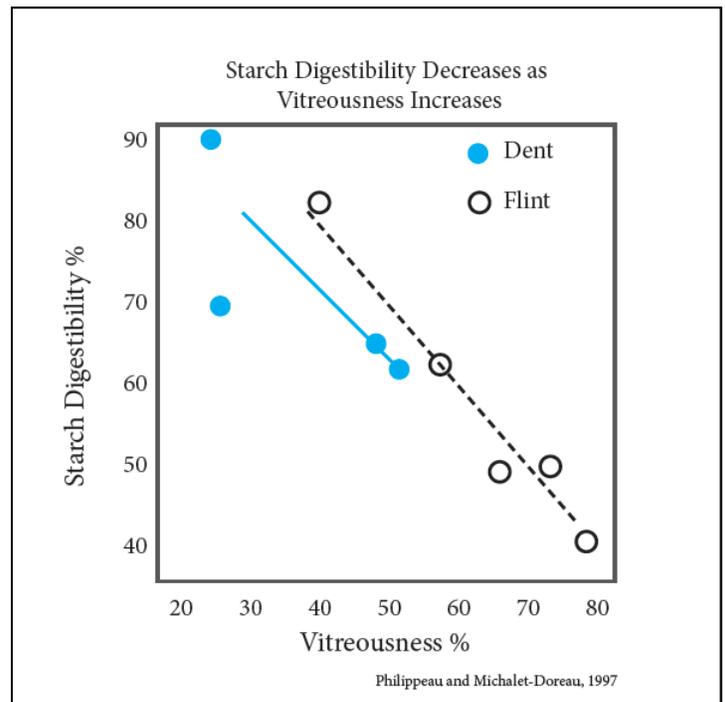
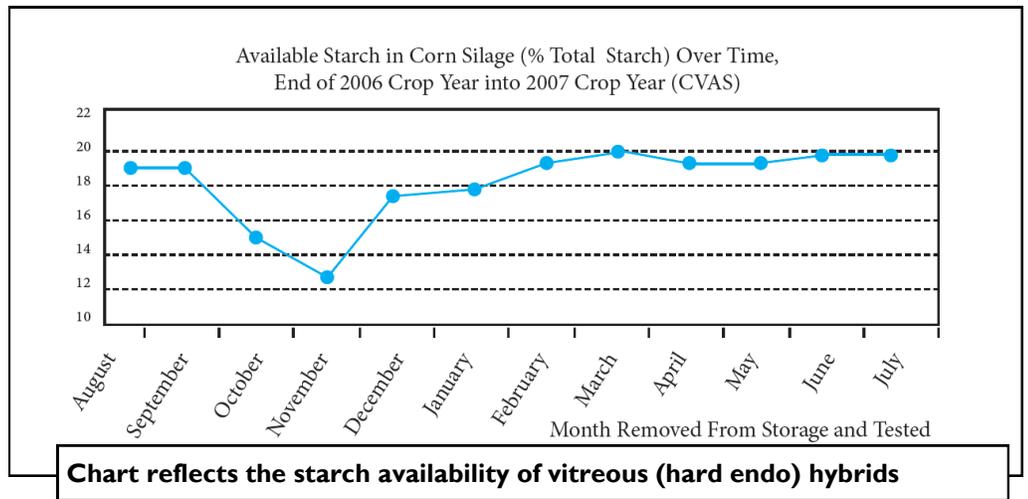
Much of what we know on how endosperm type affects ruminal starch digestibility can be taken from work done by Dr. Allen at Michigan State. You can see in the chart below how corn endosperm type, floury or vitreous, effects ruminal starch digestibility in both dry and high moisture corn. An interesting note is that in both dry and high moisture corn apparent ruminal digestibility is higher with the floury grain.

The chart to the upper right represents an enzymatic assay that CVAS conducted (vitreous corn). The data was summarized from samples that came into their lab. What is interesting is that the samples in October and November that represent the new crop corn silage are lower in starch degradability, likely because the zein protein has not begun to breakdown through fermentation. Another interesting thing is that it takes until March to get to maximum degradability.

Summary

It was a significant move for us to adapt the concept that fiber in forages had different fermentabilities based on environment, maturity, and genetics. We now accept these ideas and are routinely formulating rations based on these concepts. It should be added that we are still evolving in this area.

Likewise we are now moving into the area of starch digestibility and how endosperm type can affect this. Michigan State's 7-hour in vitro assay offers us a starting place, which allows us to see the differences in starch fermentability in endosperm type. Hopefully this too will evolve with time, as more come to realize the importance of starch fermentability in the rumen and the impact endosperm type has on it.



The Masters Choice Difference; *Two NY Dairies' Experience*

Shawn Lasher, Profitable Ag Concepts

KORONA DAIRY, PERTH, NY

Korona Dairy milks 120 registered cows. The herd averages 75 pounds on 2x milking and runs on average 4.4% Butterfat and 3.4% milk protein. The members of the dairy strive to push profitability through being early adapters of new technology and are always pushing to produce the highest quality, most digestible feed possible.

During the cropping season of 2013 the dairy grew the Masters Choice corn variety MC4560. The weather did not allow for all of the acres to be planted, so the dairy purchased two months of corn silage (Doebler's hybrid) from a neighbor. The silage was purchased in January and February to allow it time to ferment as well as minimize the chance of spoilage. A preliminary sample was taken of the corn to be purchased and the numbers on paper looked very similar to the MC4560 being fed at the home dairy.

Using the purchased silage, the diet was adjusted for dry matter to maintain the 18 pounds of dry matter in the diet from corn silage. The immediate result was a loss of 7 pounds of milk within the first 48 hours of feeding the purchased corn silage. The wet chemistry 24 hour NDFD and 7 hour starch digestibility analysis revealed the root of the problem. The purchased silage had 6 points lower starch digestibility and 5 points lower fiber digestibility despite having been fermented for 5 months. In order to maintain the same level of milk production when feeding the purchased silage, an additional 2.5 pounds of cornmeal had to be fed. This was an additional 26 cents/head cost to the dairy over and above the cost of purchasing the corn silage. The dairy's fat and milk protein also decreased during the months on the purchased forage. The difference was in the check book.

HIGH TOWER FARMS, BROADALBIN, NY

High Tower Farms LLC was a Pioneer-only farm for many years. They had always had above average yields for their area due to the management of their cropping program. In the spring of 2012 they were first introduced to Masters Choice and agreed to grow 20 acres of Masters Choice to compare 527 and 535 against their favorite Pioneer hybrids.

The Masters Choice hybrids looked healthier right from the start with a more robust stalk and brighter green color that sustained all season long. All the corn on the farm was subjected to drought-like conditions for most of the later part of the growing season. At harvest the crops were measured by a certified crop adjuster and scaled for yields. The Masters Choice corn yielded 20.6 tons to the acre as silage and 196 bushel as shell corn. This was 2.5 ton/acre more than the Pioneer hybrids planted on the same farm.

The real test was when the dairy began feeding the harvested crop. The Masters Choice corn was stored in Ag bags and kept separate from the Pioneer silage. The new crop was fed after November to ensure proper fermentation. The cows gained 8 pounds of milk when they were fed the Masters Choice silage vs. the Pioneer. Both of the silages looked to well done and full of grain, but the difference was noticed in the manure. The farmer commented about Masters Choice silage, "There just isn't any corn being wasted in the manure. The 7 Hour Starch analysis explained the why. The Masters Choice corn measured 85% digestible starch while the Pioneer hybrids were only 76% available after 4 months of being ensiled.

High Tower Dairy llc now grows Masters Choice corn exclusively and has enjoyed increased milk production for the past two years. The dairy was able to disperse 20% of the milking herd and still maintain the same pounds of milk sold a day due to increased milk production. You can't get more efficient than that!

Tool Predicts How Forage Will Feed; TTNDFD

Original Article from *Hay & Forage Grower*, Fae Holin

Figuring out how well or poorly a silage or hay will feed – before dairy cows do – has always been a challenge for producers, nutritionists and forage-analysis labs.

But a relatively new tool, called total-tract NDF digestibility (TTNDFD), seems to be accurately estimating forage value, says John Goeser, director of nutritional research at Rock River Labs, Watertown, WI.

Rock River is, at this point, the only lab to offer this forage-quality estimate as part of its advanced analysis package, and it's been difficult to explain in layman's terms how it works, Goeser says.

“The folks who do understand it are very excited, and performance has tracked very well with this metric.”

Developed by Dave Combs, University of Wisconsin dairy scientist, TTNDFD incorporates three pieces of information needed to accurately assess how a cow will use the fiber in a forage.

“And that's how much of the fiber is digestible, how fast the fiber digests and how long that cow holds that fiber in her digestive system,” Combs says. “By using those three terms together, we can come up with what we call digestibility, or how much of the fiber will be digested, within that specific cow.”

The test gives more information about fiber than comes from the 30-hour or 48-hour NDF digestibility numbers commonly reported by labs, he says.

“The first thing that any producer would want to know is, when I sample this forage, is it going to feed as I expect it to? Or is there something different about this forage that's going to make it better-utilized or more poorly utilized? The TTNDFD test can give you that,” Combs says.

“The other thing that's unique is that the TTNDFD test is a digestibility coefficient, so ration-balancing programs could use that number in part to calculate more of an energy value of the forage – the TDN (total digestible nutrient) or NEL (net energy lactation) value of the forage.”

A TTNDFD number can be used to predict how much milk production can increase or drop if forage NDF or NDF digestibility changes. It can also monitor production responses when changing rations or the types of **forages in a ration**, Combs adds.

Goeser, who used to do consulting work, used the test to explain why a large dairy herd dropped in milk production by 5-8 lbs/cow/day. “We had two corn silages that were similar when looking at the fiber level and the starch level. By looking at the fiber digestibility through TTNDFD, that helped explain where the performance loss was.”

Hay growers could use TTNDFD to compare two lots of hay with similar relative feed values (RFVs) or relative forage qualities (RFQs), Goeser says.

“If we had the TTNDFD number, that would give us even more information to assign additional value to the hay with the higher TTNDFD. Then we could market that towards high-producing, high-performing animals and save the lower-quality hay for other animals.”

Combs has put more than 15 years of research into developing the concept of the tool. Now he's conducting feeding trials “so we can measure fiber digestion totally independently of our lab tests and then predict fiber digestion with our TTNDFD assay and simply see if the two methods match,” he says. “So far, in four out of four trials, they've matched pretty well.”

**For more info on TTNDFD, visit rockriverlab.com
To find out more about *Hay and Forage Grower Magazine*, visit hayandforage.com**



King's AgriSeeds Partners with USDA–ARS

Genevieve Slocum, King's Assistant Marketing Manager

King's AgriSeeds Showcases Dual Purpose Cover Crop and Alternative Forage Crops at Ag Progress Days

At King's AgriSeeds, we specialize in high energy forages and cover crops. We research and promote the use of cover crops as dual purpose soil building and forage crops. Working with our dealer network throughout the Northeast, Mid-Atlantic and South we have been collaborating with farmers to conduct on-farm research and develop viable cover cropping options for their particular farming systems. Our goal is to help customers be more productive on a per acre basis by educating farmers about the various cover cropping options and management of these for variable contexts and rotations to get the most out of their crop and increase soil productivity.

At Ag Progress Days this month, King's AgriSeeds had an opportunity to show off many of our summer annual crops and mixes. King's collaborated with Animal Scientist Melissa Rubano (USDA-ARS Pasture and Watershed Management Research Unit) to establish small plots of summer annuals that have many applications, including summer cover crops, grazing and forage use, and soil conditioners to help build organic matter and overall soil health.

Melissa Rubano and King's AgriSeeds Research Agronomist Dave Wilson spoke to visitors at the demo plot about crop establishment, grazing, and harvest management considerations of each crop species.

All species were planted on June 6, 2014, and half the plot areas were harvested July 11, while the other half was left to grow to show comparative growth. Samples from the July 11 cutting were sent for forage analysis, and the nutritional data from this was displayed on placards at the Ag Progress Days Demo. During the demo, Melissa and Dave spoke about the nutritional values of the crops when used for grazing or harvested for forage.

Summer annuals displayed included; Daikon Radish, T-Raptor Hybrid Brassica, Purple top Turnip, Barkant Turnip, Appin Turnip, AS 9302 BMR Sudangrass mixed with Barkant Turnip, AS 6402 BMR Brachytic Dwarf Sorghum-Sudangrass mixed with Barkant Turnip, King's Agriseeds "Summer Feast" mix which consists of Wonderleaf Millet and T-Raptor Hybrid Brassica, King's "Ray's Crazy Mix" - a diverse mix of summer annuals designed for southern beef graziers to build soil and provide summer grazing, MasterGraze BMR Tillering Corn with Iron Clay Cowpeas which were drilled in perpendicular row across the corn after the corn was planted.

These diverse cover crops and grazing mixtures sparked the interest of Ag Progress Days attendees. Combinations like sorghum-sudan or sudangrass paired with a brassica are particularly good soil builders, nitrogen scavengers, and weed suppressors, and can also make high-yielding, nutritious summer forages, whether machine harvested or grazed. Brassicas contribute surprisingly high protein levels to summer mixes, while a grass like sudangrass or millet adds effective fiber. The options on display in these plots showed alternative, flexible ways for fitting in quick, rapid summer growth to round out the rotation in a pinch for forage, soil building, or both.



2015 FEEDING PACK PROGRAM *PLUS*

We are excited to present the 2015 'Feeding Pack' Program. With the success of last year's Feeding Pack Program we decided to offer the program again this year and incorporate more items from our lineup. Our goal is to encourage agronomic diversity and continue the excitement associated with building a highly productive forage system based around superior seed genetics. After reading through this, feel free to contact your local dealer with any questions. Happy Growing!!!

Orders at least 10 units of qualified products including at least three different Masters Choice 'Feeding Type' hybrids by November 20th and receive a \$5/bag discount. Order by December 20th and receive a \$2/bag. Order with your dealer.

FEATURED PRODUCTS

MASTERS CHOICE 'FEEDING TYPE' CORNS

When you have a nutritionally superior hybrid that yields well, you have an equation for profitability. MC 'Feeding Type' hybrids combine soft kernels with highly digestible stalks and leaves to create hybrids that perform in the field and in the barn. The 2015 MC Hybrid Guide lists out the Feeding Type Hybrids applicable to this program.

KINGFISHER ALFALFAS

Alfalfa varieties selected for forage quality, persistence and yield. All of these varieties have excellent leaf to stem ratios, impressive disease resistance, good yields and winter hardiness.

KING'S & BARENBRUG PERENNIAL MIXTURES

These mixtures are adapted to various regions. Mixed stands of legumes and grasses offer more agronomic stability and in general higher quality livestock forage. Legumes provide nitrogen to the soil and protein to the livestock, while grasses increase yield and add energy.

ALTA SORGHUM PRODUCTS

Alta Forage Sorghum and Sudangrasses are all eligible for this

program. These BMR Gene 6 products are the highest quality sorghum products on the market. Marked by a highly pronounced BMR gene, they offer superior digestibility as well as fantastic yields across a range of management situations.

Examples of Qualified Orders

Joe Farmer

1-MC 6580
1-MC 6750
1-MC 590
7- Kingfisher Secure BR



Richard Farmer

1-MC 6580
1-MC 6750
1-MC 6890
7-MC 590



Thomas Farmer

3-MC 6580
3-MC 590
3-MC 6890
1-Highland Hay CT
1-Kingfisher Secure BR
30-AF 7401



Examples of Un-Qualified Orders

Bill Farmer

1-MC 6580
1-MC6750
40-Beefmaster



David Farmer

1-MC 6580
1-MC 590
1-MC6750



Finance Programs for 2015

Kings AgriSeeds Pre-Pay Credit Program

PROGRAM PERIOD	CASH DISCOUNT
SEPTEMBER 1 - OCTOBER 31	8%
NOVEMBER 1 - NOVEMBER 30	7%
DECEMBER 1 - DECEMBER 31	6%
JANUARY 1 - JANUARY 31, 2015	5%
FEBRUARY 1 - FEBRUARY 28, 2015	4%

This program applies to all products. JDF has a \$1,000 minimum.

John Deere Finance Options:

John Deere Financial provides the purchasing power your customers need without tying up operating lines of credit. It also provides an additional source of credit to lock in great pricing on the products you need when you need them. Please take a look at the options below and consider how you, or your customer, can benefit from these financing options.



JOHN DEERE

DEFERRED PROGRAM PERIOD	JOHN DEERE FINANCE OFFER	FINANCE CASH DISCOUNT	CUSTOMER DUE DATE
SEPTEMBER 1 - OCTOBER 31	PRIME	3%	IN FULL DECEMBER 2015
NOVEMBER 1 - NOVEMBER 30	PRIME	2%	IN FULL DECEMBER 2015
DECEMBER 1- DECEMBER 31	PRIME	1%	IN FULL DECEMBER 2015
JANUARY 1—JANUARY 31, 2015	PRIME	0%	IN FULL DECEMBER 2015
FEBRUARY 1—JULY 31, 2015	PRIME + 1%	0%	IN FULL DECEMBER 2015

FIXED PROGRAM PERIOD	JOHN DEERE FINANCE OFFER	FINANCE CASH DISCOUNT	CUSTOMER PAYMENTS MONTHLY
SEPTEMBER 1 - OCTOBER 31	FIXED 0%	3%	10 EQUAL MONTHLY PAYMENTS
NOVEMBER 1 - NOVEMBER 30	FIXED 0%	2%	10 EQUAL MONTHLY PAYMENTS
DECEMBER 1 - DECEMBER 31	FIXED 0%	1%	10 EQUAL MONTHLY PAYMENTS
JANUARY 1- JANUARY 31, 2015	FIXED 0%	0%	10 EQUAL MONTHLY PAYMENTS
CURRENT SALES (ENDS- AUGUST 31, 2015)	FIXED 3%	0%	10 EQUAL MONTHLY PAYMENTS



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High Energy Forages and Soil Building Cover Crops

FEED First *Avoid the Fall Slump!*

Smith MW Farms (Hunter Smith, Newport PA)

Performance in the Field...

Hunter Smith planted Masters Choice 6583 in 2013 in search of a corn hybrid that would yield well on his shale soils and provide the nutritional quality he needs to maintain his high production herd. In the past Hunter had planted BMR corn, but was beginning to see that the yield drag associated with BMR was not sustainable for his farm. He needed tonnage to feed his 400+ cow herd. The MC 6583 yielded well (18-20 tons respectively). In comparison, the BMR had been yielding ~15 tons and even worse than that on really dry years.

Performance in the Barn...

As the cows transitioned into the MCT6583, they saw an increase in milk production by ~3lb/head. Everything else was constant in the ration; the only change was the substitution of the MCT6583 into the ration. In addition to the increase in milk, the cows cleaned up the MCT6583, which greatly reduced the amount of cleanout in the trough. This year Hunter and crew are utilizing multiple Masters Choice varieties (MCT 6581, MCT 4211, MCT 4884, MCT 5324, MCT 5663, MCT 6151)

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