



NDFd in dried distillers grains with solubles: Should we care?

Kevin Herrick, Fernando Diaz-Royon and Paul Kononoff for *Progressive Dairyman*

... *in vitro* systems have evolved to better predict response in the animal and, as a result, nutritionists now have the option of submitting DDGS samples to determine digestibility.

Most livestock nutritionists recognize dried distillers grains with solubles (DDGS) as a source of fat and protein. As a result, researchers have devoted a significant amount of time and resources to better characterize the fat and amino acid components of DDGS. However, we often overlook that a significant amount of DDGS is comprised of fiber. In fact, fat content (8 percent dry matter [DM]) is much less than the fiber component, while typical crude protein concentrations (31 percent DM) are similar to the concentration of the ash-free neutral detergent fiber (aNDFom) fraction (31 percent DM; **Table 1**).

Fiber terms and variability

A challenge with any fiber discussion is accurately defining the fiber terms being compared.

Components such as acid detergent fiber (ADF), neutral detergent fiber (NDF), crude fiber, total dietary fiber and soluble dietary fiber are commonly used, and each term reflects a different part of the fiber component. The fiber measures used most often in the dairy industry to describe DDGS include ADF and NDF. Generally speaking, the ADF fraction includes cellulose and the lignin component while NDF includes ADF plus the hemicellulose fraction.

We can also consider the digestibility of these fractions to evaluate fiber quality in DDGS. Methods to determine digestibility estimates have traditionally been obtained through *in vivo* or *in situ* studies. These were time-consuming, expensive and highly variable – and, as a result, very few

Item	DDGS
	Percent of DM
Dry matter	88
Crude protein	31
Fat	8
ADF	12
aNDFom	31

nutritionists saw value in trying to determine fiber digestibility of DDGS. However, *in vitro* systems have evolved to better predict response in the animal and, as

a result, nutritionists now have the option of submitting DDGS samples to determine digestibility.

We recently analyzed samples of DDGS from six different ethanol

“2 HOUR” CONCRETE RESTORATION



Armorcoat XC Systems



FROM THIS...



TO THIS...

- Full Cure in 30-60 min
- Apply Down to -20°F (-29°C)
- 20+ Year Life Expectancy
- High Chemical Resistance



FEED SURFACES



TANK ROOM FLOORS



DECORATIVE FLOORS



VANBERG


SPECIALIZED COATINGS

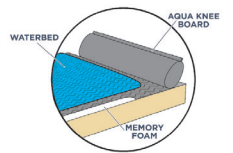
800-874-0631

www.vanbergcoatings.com

CALL ABOUT OUR BIG FALL SAVINGS

TO IMPROVE COW COMFORT, JUST ADD WATER.






Combine with SuperStall® memory foam mattress for even MORE support.

AquaStar: Instant, waterbed-like support over new or existing mattresses.

The single chamber waterbed topcover of the AquaStar system supports your cows with a surface that will not compact, is easy on hocks, and is easy to clean regardless of underlay condition or slope. Combine the best of **both** worlds – the body hugging AquaStar topcover and the stabilizing support of SuperStall memory foam for ultimate cow comfort! Contact North Brook Dairy or Bioret Agri and visit NorthBrookDairy.com or Bioret-Agri.com for more information on the newest improvement in cow comfort.

Exceeds ProAction animal welfare requirements.



Rest assured.

North Brook (877) 624-2638

© 2016 North Brook Farms

TABLE 2 Fiber components and digestibility of six dried distillers grains with solubles samples¹

Item	1	2	3	4	5	6	Avg.
ADF (percent DM)	12.2	10.8	11.1	10.1	12.0	13.1	11.5
aNDFom (percent DM)	31.3	28.9	29.9	29.2	30.3	32.2	30.3
NDFd 30 (percent DM) ²	21.8	20.3	21.3	21.1	20.0	19.2	20.6
NDFd 30 (percent of aNDFom) ²	69.6	70.0	71.3	72.3	66.1	59.6	68.1
uNDFd 30 (percent of DM) ³	9.4	8.6	8.5	8.0	10.2	12.7	9.6
Hemicellulose (percent DM)	19.1	18.1	18.7	19.0	18.2	19.1	18.7
ADF (percent of aNDFom)	38.9	37.3	37.2	34.6	39.8	40.7	38.2

¹Samples collected from 10 different biorefineries and sent to Dairyland Labs for analysis.

²NDFd 30 = 30-hour NDF digestibility as determined by in vitro degradation

³uNDFd 30 = Undegraded NDF component after a 30-hour in vitro degradation

bio-refineries located in South Dakota and Nebraska in order to better characterize DDGS fiber quality. All the bio-refineries were dry-grind, and all used corn as the only source of grain. Samples of DDGS were sent to a commercial laboratory for proximate analysis and 30-hour NDF digestibility (NDFd) (Table 2).

The ADF and aNDFom values for our small sample size had minimal variability. However, there was considerably more variability in digestibility estimates. The greatest NDFd at 30 hours was 72.3 percent of aNDFom for sample No. 4, while the least digestible was sample No. 6 which had an estimate of 59.6 percent of aNDFom.

We can speculate on why there are differences in fiber values among DDGS. First, corn varieties or growing conditions that affect the nutrient content of corn can affect many components of DDGS quality. Secondly, the ethanol process affects the fiber variability of DDGS. The dry-grind ethanol process is complex and involves many steps and variables. Enzymes, fermentation time and temperature, drying temperature and throughput are just a few factors with the potential of changing the fiber concentration or quality.

Fiber degradation rate

Concentration of fiber and amount degraded at a certain time point are not the only important measures of fiber quality. Degradation rate of the fiber is also important when trying to determine the effect of fiber quality on animal performance. In order to better understand NDFd in DDGS, we estimated NDF digestibility at 24, 30, 48 and 240 hours for the same six DDGS sources as our previous exercise (Figure 1, page 132).

Although several of the DDGS samples had very similar patterns of NDFd, there was a source that exhibited significant variability. The majority of this variability is evident at the earlier digestibility time points, with later time points having

REBEL.

Conventional wisdom says you're a lot of things...
Gentle. Nurturing. Protective. Of course, it also says those traits don't jibe with healthy profits—a notion you simply refuse to accept. After all, you've shared with us your most radical ideas for raising happier, healthier, better-producing calves. In turn, we've listened, and created products that allow you to do just that.

Now if that's not a revolutionary concept, we don't know what is.

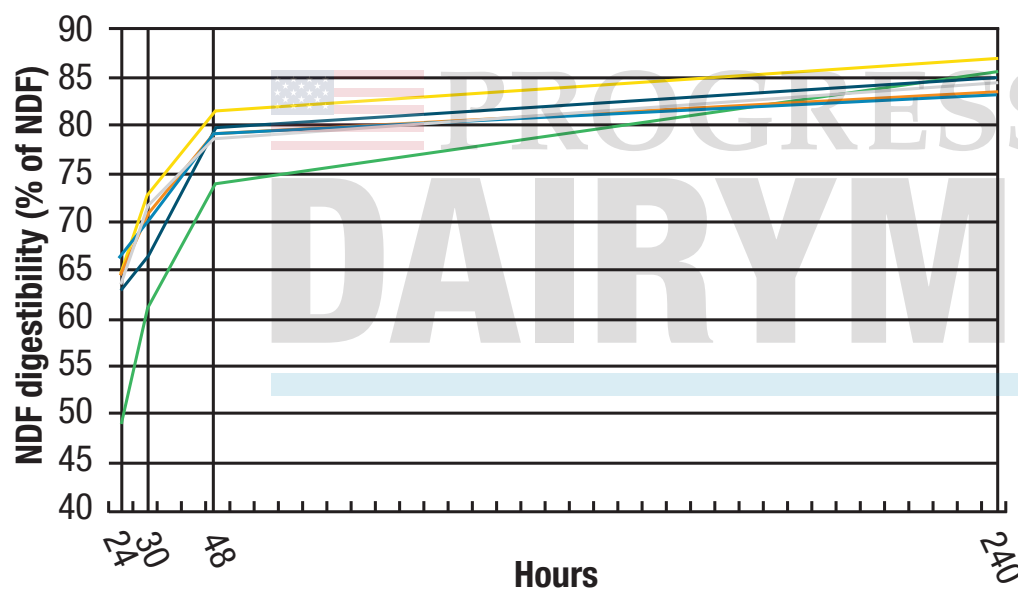
CALF-TEL
HAMPEL ANIMAL CARE
HEART MEETS SMART

CALF-TEL.COM
© 2017 HAMPEL - ALL RIGHTS RESERVED

COME AND SEE US AT WORLD DAIRY EXPO – BOOTH EH 2008-2309

Continued on page 132

FIGURE 1 Digestibility of NDF over four time points for six sources of DDGS



NDFd in dried distillers grains with solubles, cont'd from page 131

similar NDFd among all samples.

Ration implications

Utilizing predictive models of the dairy formulation software provides another option to quantify the potential effects of distillers NDFd on performance. The Agricultural Modeling and Training Systems (AMTS; Groton, New York) formulation software includes an option to estimate undigested NDF of ingredients based on the digestible NDF at certain time points.

To begin with, we created three different DDGS feeds in the AMTS library. The NDFd at 24 hours for each DDGS was changed to reflect the least (50 percent of NDF), average (62 percent of NDF) and greatest (67 percent of NDF) digestibility estimate we observed for the six samples we previously described. All values for DDGS nutrients were left unchanged from the AMTS default library value except for NDFd. We then used AMTS to formulate a high-group lactation diet to support approximately 100 pounds of milk per head per day. Forage sources included corn silage and alfalfa hay, and DDGS was locked in at 10 pounds (8.8 pounds DM) per head per day or approximately 16.38

TABLE 3 Inputs and predicted milk performance based on DDGS NDF digestibility

Item	Low-NDF digestibility DDGS	Mid-NDF digestibility DDGS	High-NDF digestibility DDGS
NDFd (percent of NDF)	50.0	62.0	67.0
NDFd hours	24	24	24
NDFd kd (percent/hr) ¹	6.7	12.2	21.8
ME allowable milk (lbs/hd/day) ¹	98.45	99.63	100.58
MP allowable milk (lbs/hd/day) ¹	97.46	99.14	100.52

¹Estimated by AMTS software

TAKE IT TO THE BUNK!

BIOTAL

You can't afford storage losses. Prepare for unexpected challenges and use the best inoculant protection your money can buy – Biotal®. Featuring specifically selected bacteria and enzymes to optimize silage preservation, Biotal forage inoculants have been proven in independent trials and commercial silage operations around the world.

When you consider the big picture, an investment in Biotal yields the best protection for your silage. That's a promise you can take to the bunk!

©2017. Biotal is a registered trademark of Lallemand Animal Nutrition. Not all products are available in all markets nor are all claims allowed in all regions.

LALLEMAND ANIMAL NUTRITION ■ SPECIFIC FOR YOUR SUCCESS
www.lallemandanimalnutrition.com





Kevin Herrick

Technical Service
Director of Nutrition
Poet Nutrition
kevin.herrick@poet.com

percent of diet DM. The DDGS feed with the average NDFd was used to formulate the initial diet.

The metabolizable energy and metabolizable protein allowable milk estimate for all formulations are shown in **Table 3**. The metabolizable energy allowable milk ranged from 98.45 to 100.58 pounds per head per day between the low- and high-NDF digestible DDGS sources. Similarly, the metabolizable protein allowable milk ranged from 97.46 to 100.52 pounds per head per day among the same DDGS sources. We recognize many variables can affect these predictions. Type of animal, stage of lactation, other ingredients and DDGS inclusion would all have an effect. However, it is an interesting exercise to demonstrate the differences DDGS NDFd may have on animal performance.

Conclusions

Fiber is often overlooked as a factor when discussing DDGS quality. However, fiber represents a large component of DDGS and, as a result, even small changes in quality of fiber can have a significant effect on animal performance. Although our sample size was relatively small, we still observed variability for both DDGS fiber content and digestibility, which we feel is representative of the industry. We also demonstrated the magnitude of change we observed can have a significant impact on potential milk production. ↩

Fernando Diaz-Royon, DVM, Ph.D., is a dairy nutrition and management consultant at Rosecrans Dairy Consulting, LLC.

Paul Kononoff, Ph.D., is an associate professor of dairy nutrition/dairy nutrition specialist at the University of Nebraska – Lincoln.

Fiber is often overlooked as a factor when discussing DDGS quality. However, fiber represents a large component of DDGS and, as a result, even small changes in quality of fiber can have a significant effect on animal performance.



LED light improves teat visibility



Effective, proprietary chlorine dioxide solution



Antimicrobial brushes inhibit bacterial growth

A brush with greatness

FutureCow® Prep System: the most consistent cow prep for any herd size.

The future of your herd's milk quality starts with consistency. Prep each cow the same way at every milking session with the FutureCow® Prep System from GEA. With the lightest brush on the market, FutureCow® provides optimal teat

cleaning, stimulation and mastitis prevention. Whether it's the first hour of milking or the very last, ensure greatness in one easy step with the FutureCow® Prep System.



gea.com