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What's New

Crops

Fertility & Soil

November 6th Webinar! Harvest, Storage, and Feed Management Considerations for the 2009 Crop

University of Wisconsin-Extension will be offering a special webinar Friday November 6th, 2009, 8:00am – 10:00am CST. Please check with your local county UW Extension office for locations offering the program. The program will be offered locally at participating county extension offices. Grain crop production specialists from UW Madison and UW-Extension will be speakers on key issues related to the 2009 harvest season.

This webinar will highlight key management decisions related to harvesting, storing, and feeding the 2009 crop. In addition, it will provide an opportunity to ask questions that have substantial economic impact on farm profitability.

This program is designed for: livestock nutritionists, crop consultants, feed dealers, farm supply agronomists and producers.

Agenda and Press Release are forthcoming, and will be posted to the WCM newsletter shortly. In the meantime, please save the morning of Friday November 6th for this important program, and contact your local UW Extension County Office for details. A directory of UW-Extension County Offices is available at: http://www.uwex.edu/ces/dir/

Title: Harvest, Storage, and Feed Management Considerations for the 2009 Crop

Date: Friday, November 6, 2009

Time: 8:00 AM - 10:00 AM CST

Weigh Risk of Leaving Corn Stand Through Winter

Nick Schneider, Winnebago County Agriculture Agent
Joe Lauer, UW Corn Agronomist

The October 26, 2009 Wisconsin Crop Progress Report from the Wisconsin Field Office of the National Agriculture Statistics Service stated only 9% of the Wisconsin corn crop has been harvested, far less than the 5-year average of 37%. Moisture spot checks are indicating very wet grain with unfavorable drying weather in the near-term forecast. Even if grain moisture was dry enough for harvest, saturated soils will likely cause further delays. This situation has caused some corn growers to consider leaving corn stand in the field until spring. Lauer (2004) examined the amount of yield loss during winter months at the University of Wisconsin Arlington Research Station in 2000-2001 (Table 1).

Many factors influence the decision to harvest yet this fall or delay until spring. Some factors can be assessed now, such as stalk strength, ear health, insect damage, and shank attachment. A crop that has weak plant integrity now is at greatest risk of crop losses if harvest is delayed. Fields with good stalk strength and a soundly attached ear might be good candidate fields for delaying harvest; however, crop health only has one direction to go…down. Beyond plant integrity, factors such as wildlife damage and weather will play a major role in ear retention the following spring. For example, in 2000, a year with heavy snow cover, the percentage yield loss was much greater than in 2001, a year with little snow cover (Table 2).

If a corn grower is seriously considering leaving corn stand through winter, the most important question that needs to be answered is, "Will the revenue lost by winter crop damage be less than the cost of drying this fall?" If the value of corn loss over winter from ear drop, fungus, or animal feeding is more than the drying bill would have been if harvested this fall, then it doesn't make sense to leave corn stand until spring. Table 3 identifies the breakeven point for total drying cost per bushel the grower would want to pay this fall compared to harvesting in spring. The table provides a total drying cost compared to a 5% to 40% winter yield loss at prices ranging from $3.00 to $4.25 per bushel. As corn price increases, the producer can tolerate paying a greater price for drying. Additionally, as the percentage of yield loss through winter increases, the producer also can justify paying a greater drying cost. For example, if this winter has heavy snowfall, similar to 2000, with a 38% yield loss by April harvest, the producer would be able to pay just over $1.31 /bu for drying corn worth $3.75 /bu (2009 price) to generate the same amount of revenue. If conditions are more like the winter of 2001 with only a 10% yield loss and a price of $3.75 /bu, then the grower keeps more revenue by letting the corn stand in the field if drying costs are more than $0.38 /bu. If in an average year 25% of corn yield is lost over winter, at $3.75 /bu, the grower can pay up to $0.94 /bu for drying and breakeven with field loss. For growers that view field drying as a secondary form of storage; thereby reducing storage fees, then the total of drying and storage costs should be combined and compared to the percent yield loss through winter.

Rather than leaving the crop stand in the field until the following spring, which can create problems preparing for the next crop, the grower might consider harvesting sometime in mid-winter. Data from the Arlington Research Station gathered over five winters found mid-May planted corn had the following grain moistures: December=22%, January=22%, February=18%, March=16%, and April=10%. Drying continues through winter but at a slower rate than fall.

Unfortunately, it is very difficult to predict in October if there will be heavy snowfall or ice sheeting come January so the decision largely becomes a matter of risk management. The 2009 corn crop was one of the most expensive corn crops ever grown and the financial losses from a large yield decline could be large. Once the grain is harvested, dried, and securely stored the harvest risk largely has been managed.

Corn crop insurance in Wisconsin ends at the earliest of: (1) total crop destruction, (2) harvest, (3) final adjustment for a loss, (4) December 10, 2009 for grain or (5) abandonment of the crop (USDA 2009). With the December 10th deadline, insurance does not extend to crop losses when harvested the following year. If the grower feels they have no other choice but to leave the crop in the field, they should contact their insurance agent prior to the deadline to discuss options.

Corn already sold for delivery through a forward contract also increases price risk if the field fails to hold yield and the grain is short of the contracted delivery amount. Another increased risk is the potential for more pest management problems such as more volunteer corn in the following crop. Deciding when to harvest this wet crop will be a tough decision, largely depending on weather factors outside of the grower's control. In times of great volatility, the decision that best manages risk is the most sensible.

References:

Lauer, Joe. 2004. Some Pros and Cons of Letting Corn Stand in

Table 1. Grain yield (bu/A) change of corn left standing in the field through winter at Arlington, WI.

	Harvest Month						
Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr
2000	204	206	113	86	83	72	127
2001	220	208	208	200	181	205	199
Mean	**212**	**206**	**165**	**145**	**134**	**145**	**162**

Table 2. Percent yield loss of corn left standing in the field through winter at Arlington, WI.

	Harvest Month					
Year	Nov	Dec	Jan	Feb	Mar	Apr
2000	No Loss	45%	58%	59%	65%	38%
2001	5%	5%	9%	18%	7%	10%
Mean	**3%**	**22%**	**32%**	**37%**	**32%**	**24%**

Table 3. Breakeven point between total drying cost versus field loss during winter field drying.

	Percent Yield Loss Through Winter							
Corn Price ($/bu)	5%	10%	15%	20%	25%	30%	35%	40%
	Breakeven Drying Cost ($/bu)							
$3.00	$0.15	$0.30	$0.45	$0.60	$0.75	$0.90	$1.05	$1.20
$3.25	$0.16	$0.33	$0.49	$0.65	$0.81	$0.98	$1.14	$1.30
$3.50	$0.18	$0.35	$0.53	$0.70	$0.88	$1.05	$1.23	$1.40
$3.75	$0.19	$0.38	$0.56	$0.75	$0.94	$1.13	$1.31	$1.50
$4.00	$0.20	$0.40	$0.60	$0.80	$1.00	$1.20	$1.40	$1.60
$4.25	$0.21	$0.43	$0.64	$0.85	$1.06	$1.28	$1.49	$1.70

the Field Through Winter. Wisconsin Crop Manager. http://corn.agronomy.wisc.edu/WCM/W160.aspx

USDA Risk Management Agency. 2009. Commodity Insurance Fact Sheet, Corn, Wisconsin. http://www.rma.usda.gov/aboutrma/fields/rma/mn_rso/

Understanding Corn Test Weight

Mike Rankin, Crops and Soils Agent, UW Extension-Fond du Lac County

Corn test weight (TW) is an often discussed topic of conversation among corn growers. The topic moves to the forefront in years when corn has been stressed at some point during the grain filling period or when the growing season is ended by frost before physiological maturity is reached. In many cases, the concept of test weight is misunderstood.

Test weight is a volumetric measurement. An official bushel measures 1.244 cubic feet. To measure TW, we usually take the weight of some smaller unit of measure and make a conversion. The official minimum allowable TW for U.S. No. 1 yellow corn is 56 lbs. per bushel, while No. 2 corn is 54 lbs. per bushel. It's unknown how this all started hundreds of years ago, but perhaps it was easier and more fair to sell things based on volume (length x width x height), something a person could see, instead of weight. Today, of course, corn is sold by weight and often in 56-pound blocks that we, for some reason, still call a bushel. Because weight is contingent on moisture content, grain buyers base their price on a "standard" moisture of (usually) 15 or 15.5 percent.

Test weight and yield...

Sometimes high TW is associated with high grain yield and low TW is associated with low grain yield. In fact, there is a poor relationship between TW and yield. The same TW can exist across a wide range of yield environments and genetics. Similarly, there can be a wide range of TW values across the same high or low yielding environment. That said, high TW corn can result in a grower being paid for more "bushels." For example, there are more bushels (those 56 lb. blocks) of 58 lb. TW corn in a truck or bin than the same truck or bin with 54 lb. TW corn.

Factors influencing test weight...

Many factors influence the measured TW of corn. The physical characteristics of the kernel certainly come into play. These include such things as size, density, shape, and "slickness" of the outer kernel layer. Hybrid differences exist for TW, but a high-yielding hybrid may not necessarily be a high TW hybrid, and vice-versa.

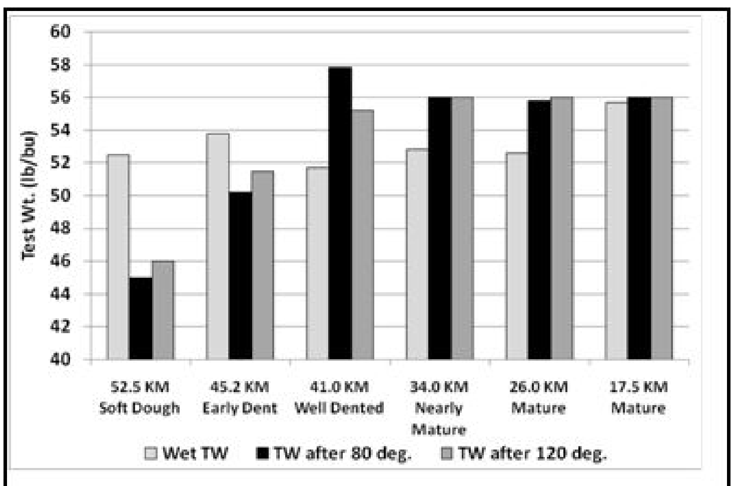

Figure 1. Wet and dry test weights for grain harvested at soft dough through mature kernel stages and dried to 15.5% moisture at 80 or 120 degrees (Hicks, 2004)

Perhaps the most important relationship to understand is between grain moisture and TW. As kernel moisture decreases, grain TW increases. Why? The reason is two-fold: as grain dries it also shrinks allowing for more kernels to "pack" into a volume bushel (think of it as the equivalent of cramming defensive linemen into a phone booth versus cornerbacks). Additionally, dry corn is naturally more slippery, or slick, which tends to allow for better packing. In 2009, it's certain that corn will come off the field wetter than most years. Expect lower TW's from the moisture factor alone.

Exactly how much TW increases after it has dried is somewhat variable. Factors such as hybrid, mechanical condition of the grain, and drying temperature come into play. Grain with a high percentage of damaged kernels will increase less than high quality grain. Grain dried at temperatures in excess of 180 degrees will also have less of an increase. Table 1 shows the "average expected" increase in TW as corn grain dries to 15 percent.

Table 1. Increase in test weight during drying for mature corn harvested between 18 and 28 percent kernel moisture

Harvest Moisture Content	Increase in Test Weight
%	lbs/bu
18	1.5
20	2.0
22	2.5
24	3.0
26	3.5
28	4.0

Other major factors influencing final TW are **plant stresses** caused by diseases, insects, soil fertility and/or environmental conditions (e.g. drought, hail, and premature frost). In other words, anything that impacts the movement of nutrients to the kernel during grain fill or degrades the integrity of the kernel (e.g. ear rots and molds) once it is filled will lower grain TW's.

Test weight and immature corn...

What happens when corn doesn't quite make it to physiological maturity (black layer) before frost puts an end to the growing season? University of Minnesota researches conducted such a study several years ago. They collected immature ears and dried them at either 80 or 120 degrees. The results are presented in Figure 1 (KM=kernel moisture).

Kernels that were in the soft dough to early dent stages actually decreased in TW after drying. Immature corn that was well dented to mature (~52-53 lbs/bu initial TW), but with high moisture content, all approached 56 lb/bu TW's after drying.

In years when corn maturity is challenged, we can expect low TWs off the field simply because of moisture. Test weight after drying will increase, but the magnitude of the increase will depend on initial kernel moisture and overall grain quality. Generally speaking, the research suggests that feeding low TW corn (fed pound for pound) results in similar animal performance as high TW corn, however, the bin or silo may empty a bit more quickly.

References:

Hicks, Dale. 2004. Corn Test Weight Changes During Drying. Minnesota Crop News. http://www.extension.umn.edu/cropenews/2004/04MNCN29.htm

Nafziger, Emerson. 2003. Test Weight and Yield: A Connection? The Bulletin, Univ. of Illinois Extension. http://ipm.illinois.edu/bulletin/pastpest/articles/200323h.html

Nielsen, R.L. 2009. Test Weight Issues in Corn. Corny News Network. Purdue University Dept. of Agronomy. http://www.agry.purdue.edu/Ext/corn/news/timeless/TestWeight.html

Combine Considerations for a Wet Corn Harvest

Matthew Digman, Assistant Professor and Machinery Systems Extension Specialist, UW - Madison

Adjusted properly, your combine can handle corn between 20 and 30% moisture. However, as moistures exceed 30%, your work will be a balancing act between leaving unthreshed grain in the field and grain damage. Here are a few tips to help guide you along in this wet harvest season.

Ground Speed

The first consideration when it comes to harvesting wet corn is ground speed. Be sure to select a ground speed that does not overload your machine as the engine must be able to maintain its rated engine speed to keep separator and cleaning shoe at full speed. Adjust your hydrostatic transmission to maintain the engine near rated speed under varying crop conditions.

Header

The usual advice for minimizing trash input into the combine by operating the header as high as possible is even more critical in these wet conditions. Introducing tough, wet leaf and stalk material into the combine reduces its effectiveness to thresh and separate the grain. Wet stalks and leaves absorb threshing energy that would normally be used to separate grain from cobs. Additionally, this wet mat of material can overwhelm the separator, trapping both threshed and unthreshed grain. Consequently, you may need to consider operating the stripper (deck) plates wider to minimize leaf and stalk material entering the combine. However, be careful to avoid shelling the butt end of the ear with the stripper plates too wide.

Concave

Before changing concave clearance, first make sure it is level side-to-side (conventional combine) or front-to-back (rotary combine) so that the adjustment is uniform. Your operator's manual will provide details for this process, but it normally involves adjusting the right and left or fore and aft sides of the concave to ensure they are uniformly spaced from the cylinder or rotor. This will ensure that in-cab adjustments are accurate across the width or length of the concave. A poorly leveled concave could damage grain on the high side while under-threshing grain on the low side. Consequently, it would be impossible to balance between grain loss and damage.

Your operator's manual will give you starting clearances for your particular machine, but generally you'll need to set your concave approximately to the diameter of a shelled cob. A properly adjusted concave will break up some cob, but excessive broken cob is an indicator that the concave is set too close to the cylinder or rotor. Too many broken cobs can lead to high levels of cob in the clean grain tank or can overwhelm the cleaning shoe.

Cylinder or Rotor Speed

After the concave is adjusted properly, adjust the cylinder or rotor speed to maximize threshing in wet grain, but make sure you balance this adjustment with grain damage. If grain damage becomes excessive, slow the cylinder or rotor. Do not increase the concave clearance. Concave spacing has very little effect on grain damage in corn.

Cleaning Shoe

Always begin harvesting with the chaffer and sieve openings to the maximum specification in your operator's manual. Closing down the sieve will produce clean corn in the grain tank, but it will also increase tailings returned for rethreshing, which can increase grain damage. If there is too much cob in the grain tank, first try increasing airflow, then close the top chaffer sieve a little and finally the lower shoe sieve a little. Wet crop residue will require higher air speed compared to a dry crop.

Repair

As with any harvest conditions, a poorly maintained combine will lead to higher grain losses and increased grain damage. Typically you'll need to increase cylinder or rotor speed to compensate for worn parts. On a conventional combine, check the concave for wear and look for rounded edges on the crossbars. On a rotary combine, check the threshing elements for worn and rounded edges. Replace concaves and rasp bars if wear exceeds the tolerances stated by the manufacturer. Please consult your operator's manual or your local dealer for allowable wear tolerances.

If you've been using the chromed rasp bars to take advantage of its wear properties, you may consider switching back to a hardened rasp bars as the "ever-sharp" edges of the chromed rasp bar may be too aggressive on this season's soft kernel.

Depending on your machine, there may be additional parts to improve threshing performance in wet crops. For example, some manufacturer's recommend rear concave inserts to improve threshing while others offer round bar concaves and separating grates to prevent crop hairpinning. Consult your operator's manual and/or your local dealer to determine what options are available for your combine.

For more information on this year's harvest including over-winter standability, storage options and drying costs, visit us at the University of Wisconsin Cooperative Extension Team Grain website at http://www.uwex.edu/ces/ag/teams/grains.

References

Allis-Chalmers. 1980. Operator's Manual: N5, N6 and N7. Milwaukee, WI

John Deere. 2006. Recommendations for harvesting field corn, popcorn, soybeans peas and edible beans - STS Combines. Solution Number 44539. Moline, IL

John Deere. 2009. Operator's Manual: 9570 STS. Moline, IL

John Deere. 2003. Operator's Manual: 9660 CTS. Moline, IL

New Holland. 2009. Operator's Manual: CR9060, CR9070 and CR9080. New Holland, PA.

High Moisture Corn Harvest and Storage Considerations

Mike Rankin, Crops and Soils Agent, UW Extension – Fond du Lac Co.

Even the best plans to ensile high moisture corn at the proper moisture level are sometimes thwarted by weather and time constraints. These types of situations prompt the question, "What can I get away with?" Here are some factors and suggestions to consider when making decisions regarding the harvest and storage of high moisture corn.

Moisture

Consider the type of silo first. High moisture corn can be stored in conventional, oxygen-limiting, bunker, or bag silos. Recommended moisture levels for these silo types are presented in Table 1.

In years when crop maturity has lagged behind normal or frost puts an early halt to the growing season, corn may be wet (or dry slowly) and maximum moisture percentage to preserve corn becomes a primary issue. For corn stored above 40% moisture, an undesirable fermentation may take place and yeast may proliferate along with high ethanol levels. Animal acceptance may be poor with this type of fermentation. Additionally, harvesting high moisture shelled corn above 32% kernel moisture for oxygen limiting silos equipped to handle high moisture shelled corn may result in unloading problems.

Processing

Most high moisture corn is processed (rolled or ground) before going into the storage unit. The two exceptions to this rule are shelled corn being stored in an oxygen limiting unit and corn that is excessively wet (near 35% kernel moisture). Take care not to over process corn that is over the desired moisture level. It is easy to get excessively fine high-moisture corn that may result in rumen acidosis, fat test depression, off-feed problems or an increased incidence of displaced abomasums. As the corn approaches optimum moisture content, increase the degree of processing.

Harvest Recommendations

Check corn kernel moisture from different fields and determine if the grain can be removed from the cob (shelled corn). Harvesting high moisture corn as shelled corn as compared to snaplage or high moisture ear corn may reduce mycotoxin risk. Harvest corn nearest to optimum moisture contents first and place at the bottom or back of storage structures. Corn with higher than desirable moisture levels may more of a problem at feed-out during the warm months and is best to put on the top or front of the silo for winter feeding. Very wet corn may be prone to aerobic instability (heating) upon removal from the silo. Plan to feed higher risk (wet or moldy) high moisture corns during the coldest months to facilitate slow removal rates if needed.

Corn with significant mold on the kernels and cob is best harvested and stored as high moisture shelled corn (rather than ear corn). Some producers have taken moldy corn and dried it down to storable moisture while screening off the fines. Where drying is not an option, propionic acid is recommended. The propionic acid will not lessen any problems from the mold, but will likely prevent mold problems from getting worse.

If high moisture corn is stored in bags, locate bags away from trees, long grass, and keep snow removed from around the bags. For best results, remove bagged high moisture corn during cooler months. Punctures, rips, or tears in the summer can cause rapid and expansive spoilage.

Preservation

High moisture corn offers some unique preservation challenges compared to corn silage because it ferments more slowly and less extensively while containing high levels of starch, which promotes aerobic deterioration. Any aid to hasten fermentation, use up available oxygen, and inhibit yeast growth (once exposed to oxygen) is beneficial in the ensiling process. Several options are currently available to producers. Here's a quick rundown of each:

<u>Standard bacterial inoculants</u>

High moisture corn inoculants have been available for many years. These primarily produce lactic acid during the fermentation process (homofermentative) and increase the speed of fermentation, while reducing dry matter loss. They MAY also increase animal performance. Choose an inoculant that has been specifically developed for ensiling high moisture corn. Specific strains of bacteria may not grow well on all crops and across a wide range of moisture contents. Thus, a corn silage inoculant may or may not work well under the drier conditions of high moisture corn. Most standard high moisture corn inoculants were developed to improve fermentation. For this reason, aerobic stability during and after feed-out may not be significantly improved. In fact, some standard lactic acid producing bacterial inoculants may actually improve fermentation but decrease aerobic stability (heating at feedout). With all inoculants, it is important to follow the manufacturer's application rates. Typical rates are between 100,000 and 500,000 colony forming units (cfu) per gram of high moisture corn.

Lactobacillus buchneri

Lactobacillus buchneri is a unique bacterial inoculant that has been developed to improve aerobic stability of silages and high moisture corn by reducing the growth of yeasts. The net result is grains inoculated with L. buchneri are more resistant to heating when exposed to air as compared to untreated silages. L. buchneri was originally isolated from naturally occurring aerobically stable silages. It is a heterofermentative bacteria that produces both lactic and acetic acid during fermentation. Silages treated with an effective dose (600,000 CFU/gram of wet corn) of L. buchneri have higher concentrations of acetic acid and lower levels of lactic acid than untreated silages.

The beneficial impact of L. buchneri appears to be related to the production of acetic acid. Although the precise mechanism has not yet been determined, it is likely that aerobic stability is improved because acetic acid inhibits growth of specific species of yeast that are responsible for heating upon exposure to oxygen. As a result, the temperature of fermented feed inoculated with L. buchneri does not readily rise upon exposure to air and tends to remain similar to ambient temperature for several days, even in warm weather. Using L. buchneri often results in a slightly higher dry matter loss during fermentation compared to standard homofermentative bacterial inoculants.

L. buchneri is a well-researched, highly effective inoculant to use for high moisture corn preservation in all storage units. Use of L. buchneri improves aerobic stability and this is important if high moisture corn removal rates need to be reduced because of mycotoxins or excessively degradable starch.

Table 1. High Moisture Corn Storage in Conventional, Bunker, Bag, and Oxygen Limiting Silos

Conventional Top Unloading Silos, Bunkers, and Silo Bags

	Corn Kernel Moisture, %		
	Minimum	Desired	Maximum
Ear Corn	26	32-36	40
Shelled Corn	26	28-32	36

Bottom Unloading Oxygen Limiting Silos

	Corn Kernel Moisture, %		
	Minimum	Desired	Maximum
Ear corn-rolled*	26	28-32	36
Shelled corn	24	26-28	32

**OL Silo with Forage Unloader*

Propionic acid

Preserving high moisture corn with propionic acid or propionic acid mixtures (propionic, acetic, benzoic) has been a proven effective practice for many years. However, it is more costly than simply using a standard inoculant and requires specialized equipment to apply. There are several situations where the use of propionic acid to reduce pH and preserve corn makes good sense. In years past, some producers have successfully used concrete or wood floors/bins to store high moisture corn. In this case, it's a must that corn be treated with propionic acid. Applying propionic acid at the proper rate reduces the pH of preserved corn to about 4.0 and inhibits the growth of harmful microorganisms. The cost of treatment is usually comparable to that of on-farm drying.

The proper application rate depends on two factors: 1) the moisture content of the grain, and 2) the intended length of storage (Table 2). Rates are based on pounds of actual acid. It's most economical to treat corn with acid when kernel moisture is near 30 percent. It typically takes 10 to

Table 2. Recommended application rates of propionic acid to preserve high moisture corn

Corn moisture %	Lbs. propionic acid to apply per 1000 lbs. wet corn[1]		
	--------------------*Months corn to be stored*---------------------		
	6	9	12
20	3.3 - 5.0	4.0 - 6.0	5.0 – 7.5
25	5.0 - 6.5	6.0 - 8.5	7.5 – 10.0
30	6.5 - 8.5	8.5 - 11.0	10.0 – 12.5
35-40	8.5 - 10.5	11.0 - 14.0	12.5 – 15.0

[1]Use lower rate for well-mixed corn and higher rate if acid and grain cannot be well-mixed.

20 lbs. of actual acid to fully preserve a ton of high moisture corn.

Another situation where acid may prove beneficial is when an upright silo is being filled but not fed from for an extended period of time. In this case, producers often only apply acid to corn that will fill the last 5 to 10 feet at the top of the silo. It is at the top where spoilage is most likely to occur as a result of oxygen infiltrating the grain. Again, determine rates based on length of storage and moisture.

Feedout

Be careful to plan for variable removal rate from the silo. A removal rate of 3 to 4 inches per day is typically required to prevent heating during feeding in warmer weather. However, if the high moisture corn contains mycotoxins or is wet with rapidly degradable starch, which may induce acidosis, the removal rate may need to be reduced to augment the addition of clean dry corn to the diet. Treating the bottom third to half the silo of high moisture corn with *L. buchneri* or propionic acid (12-15 lb/ton) may be desirable to insure flexible removal rates and maintain quality during warm weather feeding.

Adding Organic Acids to High Moisture Corn

Patrick Hoffman and Irv Possin

Introduction

In situations where fermentation of high moisture corn (HMC) is in jeopardy, treatment with organic acids can prevent heating and mold growth. Organic acids can also be used to preserve HMC when adequate storage space is not available. Animals fed HMC treated with organic acids perform similar to animals fed untreated HMC.

When should high moisture corn be treated with organic acids?

If high moisture corn is harvested and stored under recommended conditions, there is no need to treat with organic acids. If, however, conditions exist that jeopardize HMC fermentation, use of organic acids is highly recommended. Fermentation of HMC can be poor for several reasons including:

- moisture content of corn is too low (<26%)
- corn is put into a poor storage unit
- feed removal from storage unit is too slow
- there is a history of chronic heating or molding
- HMC is moved to another storage structure.

What kind of organic acid should be used?

Organic acids come in two basic forms: pure acid or buffered acids. Pure acids include propionic acid, acetic acid, citric acid, and benzoic acid. Buffered organic acids include calcium and sodium salts of propionic, acetic, citric, and benzoic acids. Organic acids can also be buffered with ammonia, resulting in the ammonium salts of propionic and acetic acids. Buffered organic acids come in dry or liquid formulations. Buffered organic acids are safer to handle and less caustic to machinery. When choosing an organic acid, select a product that is predominately made up of propionic acid and has a high percent of active ingredient. In general, liquid products are preferred because they can be applied more evenly.

What organic acid application rate should be used?

There are two philosophies of organic acid application for HMC preservation. The first philosophy is that of full preservation. To effectively preserve HMC for one year, 10 to 20 lbs (active ingredient) of organic acids are required per ton of HMC.

A second philosophy is to apply organic acids at low rates of 2 to 5 lbs (active ingredient) per ton of HMC. These low application rates of organic acids are intended to aid in aerobic stability of HMC at feedout. The theory of this practice is to control yeast populations at feedout time. Normal HMC fermentation results in the production of lactic acid. At feedout, some yeast species can assimilate (eat) lactic acid and cause HMC to heat and mold. Yeast cannot assimilate propionic acid. Therefore, low application rates of propionic acid stabilize HMC at feedout by controlling buildup of yeast populations. It should be remembered, however, that low application rates of organic acids do not provide full preservation and high quality HMC is still dependent on normal fermentation. Therefore, when using low organic acid rates, it is advised to use an inoculant (specifically developed for HMC) at ensiling time to help insure adequate fermentation of the HMC.

Does organic acid treated corn affect animal performance?

Studies comparing normally fermented HMC to organic acid treated HMC show no differences in palatability, intake, or animal performance.

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2009-2010 Dairy Cattle Feeding Issues with High-Moisture Corn, Snaplage and Dry Shelled Corn

Paul Esker, Randy Shaver, Jim Leverich, Mike Ballweg, Pat Hoffman and Mike Rankin - University of Wisconsin Extension

Cooler than normal summer growing conditions coupled with a killing frost in early October is causing high-moisture (HM) and dry corn to be harvested at higher than normal moisture contents. Dairy cattle feeding issues that may arise during feed-out of wet HM corn include: reduced starch content, fast rate and high extent of ruminal starch digestion, and mold/mycotoxins. Some of these same issues may also arise with feeding corn harvested for dry shelled corn that had been exposed to a killing frost prior to reaching physiological maturity.

High-moisture corn is most commonly combine-harvested as shelled or ear corn. This year there will likely be more snaplage harvested and fed, because harvesting as snaplage allows for greater kernel moisture at harvest using silage choppers equipped with a snapper head and an on-board kernel processor to hasten the harvest. Snaplage contains kernels and cob and varying amounts of husk and ear shank. Therefore, one can expect the neutral detergent fiber (NDF) content to be higher and the starch content to be lower for snaplage than HM ear corn. Furthermore, the concentrations of NDF and starch in snaplage can be highly variable. Dairy cattle feeding issues that may arise during feed-out of snaplage include: variable starch, NDF, energy and dry matter (DM) concentrations, fast rate and high extent of ruminal starch digestion, and mold/mycotoxins.

Starch, NDF and DM Concentrations

The normal starch content of shelled corn in the Midwest is 68% to 70% (DM basis). Corn that went through a killing frost prior to reaching the black-layer stage or physiological maturity may contain less starch and possibly energy. Snaplage hybrid test plot data from southeastern MN showed that starch, NDF and DM concentrations ranged from 55% to 64%, 14% to 22% and 53% to 67%, respectively (Mahanna, 2008). Commercial feed testing laboratories routinely analyze HM corn, dry shelled corn and snaplage for starch and NDF concentrations and can estimate the energy value of corn from its nutrient composition using summative energy equations; this should be done during feed-out. Knowing the starch and NDF content and energy value of corn will allow dairy cattle nutritionists to adjust the feeding rate of the corn accordingly during ration formulation. Depending on the other ingredients in the ration, the quality of the snaplage, the nutrient composition of the ration and the level of milk production of the dairy herd, there may be a need to supplement dry ground shelled corn along with the snaplage to meet the dietary energy requirement. It will also be important to determine and monitor the DM content of the HM corn and snaplage frequently on the farm so that the as-fed feeding rates can be adjusted accordingly and the desired amounts of DM fed.

Ruminal Starch Digestion

Corn that is harvested with more than 32% kernel moisture and preserved as HM corn can have a fast rate and high extent of ruminal starch digestion, especially if processed finely. Current research suggests that the rate of starch digestion for HM corn will increase as the length of storage time increases, which means that the rate and extent of ruminal starch digestion for HM corn may be higher the following spring or summer relative to the fall feeding period. Depending on the other ingredients in the ration and the nutrient composition of the ration, a fast rate and high extent of ruminal starch digestion could result in reduced ruminal pH and fiber digestion and a depression in milk fat test. A coarse roll (2500-3000 micron mean particle size) is all that is needed for processing of wet HM corn. Sometimes though the normal corn harvest and storage processes, moving corn through combine, augers, roller mill, and silo blower and un-loader, can cause wet HM corn to become too fine. The particle size of HM corn should be determined at commercial feed testing laboratories using sieving procedures. For wet HM corn a mean particle size less than 1,500 microns may be cause for concern in some feeding situations. If animal performance issues arise from the feeding of wet - fine HM corn then the following options may be considered by dairy cattle nutritionists: reduce the amount of corn fed, partially replace the wet - fine HM corn with dry - coarser dry shelled corn, reduce the dietary starch content by partially replacing the wet - fine HM corn with high digestible byproduct fiber sources, and (or) increase the amount of buffer being fed.

A coarse roll is all that is needed for processing of snaplage to break the kernels. If animal performance issues arise from the feeding of snaplage which has had the kernels processed too finely then the following options may be considered by dairy cattle nutritionists: partially replace the snaplage with dry - coarser shelled corn, and (or) increase the amount of buffer being fed.

Mold/Mycotoxins

The risk for mycotoxin contamination in HM corn or dry shelled corn first requires proper identification of the different ear. Scouting should occur as soon as possible to identify the type of ear mold and extent of the disease in the field. Based on various reports from around the state, the primary ear molds include Diplodia, Fusarium, Gibberella, and Penicillium. Conditions have been less favorable for the development of Aspergillus. In terms of mycotoxins, there is a lower risk of mycotoxin contamination in ears that have Diplodia or Penicillium, compared with Fusarium and Gibberella.

Symptoms of Diplodia ear rot include a heavy or thick white mass of mold, where the kernels almost appeared “glued” to the husk. These symptoms will most often be observed at the base of ear. Infections of Diplodia occurred during the tasseling to early silking period. Fusarium ear rots can be caused by different species of *Fusarium* and symptoms will vary greatly depending on hybrid and environment. Typically, symptoms are whitish to pink and can also cause a “starburst” appearance on the kernel. Infected kernels are usually scattered throughout the ear. Gibberella ear rot symptoms also appear reddish in appearance, but infected kernels are more likely to be found starting from the tip of the ear. Lastly, Penicillium ear rot is characterized by a powdery green or blue green mold on and between kernels. Areas where damaged has occurred on an ear often show the initial symptoms.

Mycotoxin development is highly dependent on the environment, factors that may cause wounding on the plant, or can occur when resource demand is high or resources are limiting. Temperatures above freezing, moisture above 20%, and oxygen are key factors for mycotoxin contamination. The longer corn remains in the field, the higher the risk for mycotoxin development. Grain that is damaged in the field should not be mixed with good grain. Proper drying ensiling conditions can help reduce the risk of contamination, however, it is important to monitor grain bins throughout the winter period since can be contamination that occurs towards the end of silage use when an infection occurred in the field. It is recommended to test HM corn or dry shelled grain for mycotoxins from any field where there was evidence of ear molds before feeding to animals (Table 1).

Fusarium mycotoxins: These mycotoxins include deoxynivalenol (DON; produced by several species of *Fusarium*, including *F. graminearum*), zearalenone (*F. graminearum*), and fumonisin B1 and T-2 (multiple species of *Fusarium*). Of these mycotoxins, DON is the most common. In silage, DON does not appear to have a significant effect, however, in grain, production of DON is favored by grain moisture of 21% or more and temperatures from 21-29ºC. It is thought that rumen microorganisms are also able to degrade DON to less toxic form.

Penicillium mycotoxins: In silage, *P. roqueforti* is a common fungus. This organism is a saprophyte that grows well in low oxygen and acidic environments. There are multiple toxins produced by *P. roqueforti*, including, PR toxin, roquefortin C, patulin, and mycophenolic acid. While the effect of these toxins on dairy cattle is not well known, proper harvest timing and ensiling can reduce the risk of toxin development.

Table 1. Directory of mycotoxin laboratories. Labs may offer qualitative and/or quantitative analysis of different mycotoxins. We recommend that individuals contact laboratories directly to find out how best to prepare a sample for submission, prices and services offered, and other additional details that may be required to conduct a proper test. For further information, please consult A3646-Pest Management in Wisconsin Field Crops.

Covance Laboratories 3305 Kinsman Boulevard Madison, WI 53707 (608) 241-4471	Midwest Laboratories 13611 B Street Omaha, NE 68144 (402) 334-7770	Veterinary Diagnostic Labs Iowa State University 1600 South 16th Street Ames, IA 50011 (515) 294-1950
Centralia Animal Disease Laboratory Illinois Department of Agriculture 9732 Shattuc Road Centralia, IL 62801-5858 (618) 532-6701	Romer Labs, Inc. Attn: Analytical Services 1301 Stylemaster Drive Union, MO 63084-1156 (636) 583-8600	Veterinary Medical Diagnostic Laboratory 1600 East Rollins Columbia, MO 65211 (573) 882-6811
Dairyland Laboratories 217 East Main Street Arcadia, WI 54612 (608) 323-2123	Veterinary Diagnostic Laboratory North Dakota State University 174 Van ES Hall Fargo, ND 58105 (701) 231-8307	Woodson-Tenent Laboratories 3507 Delaware Avenue P.O. Box 1292 Des Moines, IA 50313 (515) 265-1461

Renewed interest in snaplage displayed

Bill Mahanna

It is my impression that there was a resurgence of interest among dairy producers and nutritionists in harvesting high-moisture corn as snaplage this past fall. This is partly due to snaplage being heavily promoted by custom cutters who were eager to secure more business for their forage harvesting crews and partly due to the increasing cost of harvesting with a combine and processing at the bunker. Recent studies have also confirmed that if harvested at the proper kernel moisture, snaplage can have an extremely high feeding value if harvested, processed and stored correctly.

To continue reading this article click here.

Considerations for Artificial Drying of Soybeans

Bill Halfman, Greg Andrews and Bob Cropp, Extension Ag. Agents

This fall's weather may create situations where some growers will be tempted to artificially dry their soybeans. It is not a good situation when growers need to consider artificial drying of soybeans. It presents several challenges in order to keep the soybeans at an acceptable quality level to avoid dockage. Growers will have to weigh the advantages and disadvantages for their own operation to determine what is best for their situation.

Soybeans can be harvested without too much damage up to about 18% moisture. If soybeans are harvested at a moisture content much above 13%, artificial drying is necessary.

There is not much published research on soybean drying. Most of our drying recommendations are based on limited experience or are extrapolated from corn drying recommendations. In most cases, dryers that were designed for corn can be adapted for use with soybeans. Bill Wilke, University of Minnesota Crop Storage and Handling Specialist, offers the following information on artificial drying of soybeans.

Natural-air drying

Using unheated air to dry soybeans usually works well, but it is a slow process (two to six weeks, depending on initial moisture, airflow, and weather). Bins used for natural-air drying should have full-perforated floors and fairly large drying fans. Fan power requirements depend on desired airflow and depth of beans. For example, delivery of 1.0 cfm/bu (cubic feet of air per minute per bushel of beans in the bin) through an 18-ft depth of soybeans would require about 0.6 hp (horsepower) per 1000 bushels of beans in the bin, while delivery of 1.5 cfm/bu through 18 ft of beans would take about 1.6 hp/1000 bu.

Management of natural-air soybean dryers is similar to that for natural-air corn dryers, except that soybean moisture values need to be about two percentage points lower than those recommended for corn. In southern Wisconsin, use an airflow of 1 cfm/bu to dry 17 to 18% moisture beans, 0.75 cfm/bu for 15 to 17% moisture beans, and 0.5 cfm/bu for 13 to 15% moisture beans. In northern Wisconsin, higher airflow is needed since fewer days are available for drying in the fall. In northern areas, use 1.0 cfm/bu to dry soybeans that are 16% moisture or less, 1.25 cfm/bu for 17% moisture beans, and 1.5 cfm/bu for 18% moisture beans. See Natural-Air Corn Drying in the Upper Midwest, BU-6577, available from the UofM Distribution Center or Natural-Air/Low-Temperature Crop Drying, EB-35, from the NDSU Distribution Center for information on equipping and managing natural-air dryers.

Because natural-air drying is a slow process, it will be difficult to use one bin to dry both beans and corn in the same year. Don't plan on having the beans dry before corn harvest unless the soybeans are only slightly wetter than 13%, or unless you use a shallow drying depth.

Low-temperature drying

Early in the fall, especially in years with warm, dry weather, it is possible to dry soybeans to less than 13% moisture with no supplemental heat. (See previous section on natural-air drying.) However, late in the fall, or in years with cool, damp weather, soybeans might not dry to 13% and it might be helpful to add a small amount of supplemental heat to the air in natural-air dryers. Do not heat the air more than 3 to 5 degrees F, though, or you will over dry the beans and you might cause an increase in splitting. Research has shown that exposing soybeans to relative humidity values of less than 40% can cause excessive splitting. For every 20 degrees F that you heat air, you cut its relative humidity approximately in half, so it doesn't take very much heat to produce relative humidity values less than 40%.

Some alternatives to adding supplemental heat to natural-air drying bins include:

- Turning off the fan when weather gets cold in the fall, keeping beans cold during winter, and resuming drying when average temperatures climb above freezing in the spring.
- Installing bigger fans so that you can finish drying earlier in the fall when weather is better.
- Using manual or automatic control to turn off the fan during periods of high humidity. Fan control will increase the amount of time required for drying, but it will result in drier beans.

High-temperature drying

Soybeans can be dried in a high temperature dryer, but the plenum temperature needs to be limited to minimize damage to the beans. Many kinds of gas-fired corn dryers can be used to dry soybeans, but be careful. Refer to the manufacturer’s recommendations for maximum drying temperature. Typically the maximum drying temperature for non-food soybeans is about 130 degrees. Even at that temperature some skins and beans will be cracked. Soybeans split easily if they are dried too fast or are handled roughly. Set the drying air temperature lower than you would for corn and avoid dryers that recirculate the crop during drying. Column-type dryers can often be operated at 120 to 140 F without causing too much soybean damage, although some trial and error might be required to set dryers properly. Examine beans leaving the dryer carefully and reduce the temperature if you're getting too many splits. If the soybeans will be saved for seed, keep drying temperatures under 110 F to avoid killing the embryo.

Don't forget that crops dried in gas-fired dryers must be cooled within a day or so to remove dryer heat. This can be done in the dryer or in aerated storage bins. Stored beans should be aerated again later in the fall to cool them to 20 to 30 F for winter storage.

Immature, frosted, or green-colored beans

In years when frost kills soybean plants before the seeds are fully mature, make sure you remove as much chaff and green plant material as possible before binning the beans. Immature beans can be stored without significant molding, but concentrations of green chaff can lead to heating in storage. Although it is commonly stated that green soybeans will eventually turn yellow in storage, the color change observed in a U of Minnesota laboratory study was minimal. It might still be worthwhile to store green soybeans for a few months after harvest though, to avoid the high discounts that are applied in years when large quantities of green beans are delivered during harvest. Just make sure that any green beans going into storage are clean, evenly distributed throughout the bin, and cooled as soon as possible after harvest.

Calculating Grain Weight Shrinkage in Corn Due to Mechanical Drying

O. R. Hicks and H. A. Cloud, University of Minnesota

Following harvest, a corn grower must usually decide whether to sell wet corn "as is" at a mositure discounted market price or mechanically dry the grain (on-farm or by custom drying) al a total cost the grower hopes is less than the moisture discount. One of the expenses involved in mechanically drying grain is the "cost" of the weight loss that occurs during the drying process. This weight loss by drying is referred to as "shrink" and is expressed as a percentage of the original quantity before it is dried. Growers must calculate shrinkage in order to accurately determine the total cost of mechanical drying. (For more information on determining the profitability of on·farm drying see NCH-21 "Economics of On· Farm Corn Drying. ")

To Continue Reading, click here.

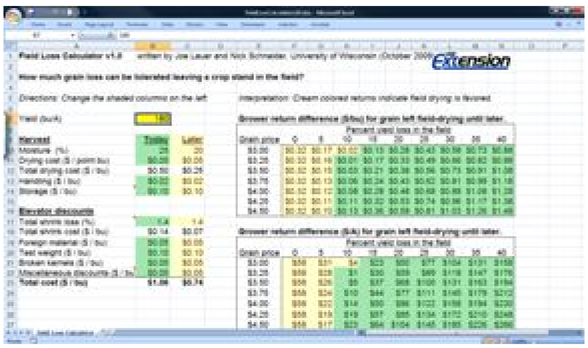
Grain Drying and Storage Publications

Brian Holmes, Biological Systems Engineering

Need information on grain drying and storage? Visit the link below to find offerings by MidWest Plan Service.

http://www.mwps.org/index.cfm?fuseaction=c_Categories.viewCategory&catID=715

Field Loss Calculator



This MS Excel spreadsheet allows producers to calculate the influence of harvesting today versus allowing the crop to stand in the field and harvesting later. It accounts for higher drying costs versus grain losses during field drying. It allows the user to account for elevator discounts and grain shrink.

Click here to go to the WCM Downloads Page and then click on Field Loss Calculator to go to the MS Excel 2007 Version

Note: This spreadsheet is saved using MS Excel 2007. To install a converter for earlier versions of Excel click here.

MS Excel 2003 version

The Economics of Soil Testing

Matt Ruark, Department of Soil Science

Soil testing is the only tool we have to evaluate pH, phosphorus (P), and potassium (K) status of the soil. Knowing this information allows growers to make economically optimum applications of lime and phosphorus and potash fertilizer. In these times of economic uncertainty, managing input costs is an important component of farm sustainability. Many growers have opted to cut costs by eliminating soil testing as part of their management program. *This is not a recommended strategy*. There are two main misconceptions about soil testing:

MISCONCEPTION #1: Soil testing is expensive.

FACT: Routine soil testing costs about $0.35 per acre. University of Wisconsin soil testing recommendations are to collect one composite sample per five acres and to soil test at least once every four years. Using a standard rate of $7.00 for routine soil analysis (which includes pH, P, K, and organic matter), this averages out to $0.35 per acre per year. All Wisconsin Department of Agriculture, Trade and Consumer Protection Certified Laboratories are required to provide fertilizer recommendations based on University of Wisconsin guidelines along with the soil test values. (Note: actual cost of soil test may be slightly higher depending on the lab and if shipping costs are incurred)

MISCONCEPTION #2: Maintenance applications of P and K are appropriate in all situations.

FACT: Soils testing in the "Very Low" and "Low" range for P and K require additional inputs beyond removal rates to optimize yield.

FACT: Soils testing in the "High" and "Excessive" range for P and K require less than removal rates to optimize yield.

In either case, money is lost from either reduced yields or over-application of P and K. When soil tests indicate the soil is in the very low to low category, this suggests that there is a high likelihood that yields will increase due to application of fertilizer. However, it also indicates that the subsequent crops would benefit from building the "fertility" of the soil through additional P and K inputs over time.

For more information on soil testing, please visit our website www.soils.wisc.edu/extension/soilsampling.php