Nutritional Insights

MANAGEMENT RECOMMENDATIONS FOR HARVESTING HAIL-DAMAGED CORN AS SILAGE

Information from Pioneer Hi-Bred International, Inc. Nutritional Sciences September, 2008

Q: When should I start cutting hail-damaged corn for silage?
A: You should wait until the whole plant moisture level is below 70% moisture. Ideal moisture level for unprocessed corn silage in bunkers or pits is 62-70% moisture. It will be very important to be patient and let the hail damaged stalks dry down to the proper moisture level. Also realize that the window for proper moisture will be very narrow. Plants with fractured stalks should dry down more rapidly than stalks with less stalk damage and some leaf area still attached. Grain maturity or milk line will not be a good indicator of the moisture content in this damaged corn. We recommend moisture testing of chopped material and utilizing a microwave or Koster tester for the best assessment of moisture content.

Q: How do I know if the field is worth cutting?
A: Determine if there is adequate tonnage to economically justify chopping the silage versus using resources to purchase other forage sources such as dry hay. We suggest chopping a sample load to estimate tonnage and to monitor moisture levels. Harvests costs considerations need to be assessed and will vary by geography for silage chopping, hauling and packing. A thumb rule is that immature hail damaged corn will likely be 70% of the value of normal mature corn silage (adjusted to 65% moisture). You must figure your own situation in regard to costs and tonnage yield levels; Pioneer professionals can offer decision aids to assist you in making these financial decisions.

Q: What will the nutritional value of late planted or immature hailed damaged corn harvest as corn silage be?
A: This is largely dependent on how far along the corn grain development is and the degree of defoliation. There is considerable research on drought stressed corn silage, with little or no corn grain, that has shown this material as a feeding value range of 75-90% of mature corn silage. Silage with 10% grain, as a dry matter basis, will yield around 70% the feed value of mature silage containing 50% grain on a dry matter basis. Untranslocated sugar in the stalk along with reduced fiber maturity contributes to enhanced stover feeding value yielding silage that feeds better than expected given the dramatic reduction in grain content.

The untranslocated soluble carbohydrates in the form of stover sugars are not going to be converted to starches as they would be in mature corn. Much of the sugar will be converted to acid during the ensiling process (which can be prolonged in very wet silage’s). The remaining residual sugar will provide excellent substrate for the rumen microflora and somewhat compensate for the decline in starch. The protein content may be slightly higher in the immature corn since accumulation of starch during maturation tends to cause a dilution affect. Some of the nitrogen may still be in the nitrate form, if there is little grain. It is a good idea to check nitrate levels before feeding.

There may be some concern for palatability on this type of silage compared to normal corn silage, especially given the potential for altered fermentation profiles. Inoculation is recommended to control the fermentation and ensure more consistent silage presented to the animal. Without controlling the fermentation, one could expect this wetter silage to have a greater acid content that could result in slightly lower intake, especially if atypical levels of butyric acid are produced during the fermentation.
Q: Are there special management practices that one should consider when harvesting and packing this type of silage in bunkers?

A: Management of immature corn is going to be more critical since it will likely be wetter than normal. It may not be unusual to experience upper 70% to lower 80% moisture levels while making moisture determinations with Koster Cookers or microwaves. If the corn is irrigated it may be advisable to pull the water off sooner than normally would with corn that has reached the early dent. These immature plants will take up more water than plants that has started to mature.

With the high moisture content, you can expect the corn will have some effluent runoff. Be sure you get a good clean chop and avoid tearing the material. As far as packing, it should be pack well but you may not want to stay on the wet corn quite as long as well-eared corn since the risk of bruising the material is greater, which can lead to increased runoff from cellular rupture. You should consider not processing hail damaged and immature corn forage due to the softness of the cobs, the lack of starch and the potential for stover cell damage resulting in increased effluent.

Aerobic stability (bunklife) can also be a challenge with hail-damaged corn silage due to the elevated sugar content (substrate for spoilage organisms during feedout) and the potential for mold/yeast contamination since the protective coating (sheath and husk) are damaged allowing easier entry for field spoilage organisms.

Storing hail damaged corn silage in a separate storage structure is advisable so that feedout plans can be tailored and ration formulation changes made to properly incorporate this silage into the ration.

Q: Are molds and mycotoxins more likely to occur in hail damaged corn?

A: The likelihood of molding exists anytime the integrity of the plant is jeopardized due to bruising of plant tissues. Molding in the field in northern environments will likely be Gibberella ear rot that can produce vomitoxin, zearalenone, and T-2 mycotoxins, while southern environments will likely be Aspergillus ear rot that can produce aflatoxin.

Screening for mycotoxins at time of harvest is advisable to make sure the silage is properly managed during feedout to appropriate classes of cattle and to determine if a mycotoxin adsorbant should be incorporated into the ration.

Further molding may occur during the storage if optimal silage management practices (e.g.: harvest moisture, packing, sealing) are not followed to produce a terminal 4.5 pH or lower. The silage environment is suitable for mold activity to occur in the silo if pH is above 4.5 and oxygen from air is present. Such molds that can grow during silage storage and produce mycotoxins include species of Penicillium, Aspergillus. Many other molds aren’t known to produce mycotoxins, but do utilize nutrients and produce unpalatable and musty end-products. Mycotoxins produced by storage molds can not be screened for by commercial laboratories, therefore the silage should be cultured by laboratories to determine if mycotoxin producing molds exist.

Q: Will this silage be worth inoculating? Will the response to inoculation be greater or less than inoculating normal, mature corn?

A: You should definitely inoculate the immature corn because: 1) it will likely be wetter than normal silage, 2) the sugar content will increase chances of having bunklife problems, 3) this silage is a prime candidate for yeast and mold contamination and clostridial fermentation, and 4) the silage may have high value given the reduction in alternative forage replacement opportunities in your area. Inoculation will help manage these problems by providing a fast and efficient fermentation resulting in less fermentation loss, improved bunk life and reduced risk of clostridial fermentation.

Pioneer™ brand 11C33 or 11CFT combination inoculant products would be the inoculant of choice (compared to Pioneer® brand 1132 or 1174) due to the more defensive stance necessitated by these conditions and the fact that hail-damaged silage has reduced feeding value from lowered starch (grain) content. 11C33 and 11CFT contain bacterial strains that will 1) dominate in producing an efficient front-end fermentation and 2) enhance bunklife properties during feedout from dominance of Lactobacillus buchneri bacterial strains. While inoculant is not going to make a bad situation into a good one, the benefits of inoculating immature corn are as great or greater than inoculating normal corn silage given the opportunity for fermentation problems in this situation.

Q: How much more will the immature corn shrink compared to mature corn silage?

A: Depends on the management and the moisture content at harvest with shrinkage greatly increased if silage is put up too wet. A normal storage loss for corn harvested at 62-70% moisture is 12-18% in well-managed bunker silos. Extremely wet silage (>72% moisture) could have losses as high as 30-50%, with high levels of effluent runoff coupled with clostridial fermentations. The potential for increased shrink loss needs to be considered when estimating required feed inventories.

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**Q: How much tonnage can be expected?**

A: As mentioned earlier, chopping a representative area of the field will provide the best estimate of yield potential. Basically, silage yield is a function of both grain yield and stover yield. The more grain and the further the development of the plant the greater the yield. Most yield reduction in corn due to hail damage is a result of the loss of photosynthetically active leaf area. If leaf area destroyed is 50% and the corn is in the brown silk stage, grain losses are estimated to be reduced by approximately 26%. If leaf damage is 75% grain reduction can be 50% or more.

Most tonnage estimates suggest that 30-50% of total dry matter weight of mature silage comes from the ear. Therefore, fields in the blister stage with little or no grain development potential and all leaves removed but the whole plant intact, could possibly yield in the 6-8 ton per acre at 65-68% moisture. These are just estimates and each field will vary greatly depending on degree of damage.

**Q: Will nitrate content be a concern?**

A: Yes, nitrate content could be a major concern. Ensiling the plant, will automatically reduce nitrate levels by around 50% and the reduction will occur very rapidly. There could be a very high potential for nitrate poisoning if these stalks are grazed. The nitrate will concentrate in a lower stalk. The higher the rate of nitrogen fertilizer or carryover nitrate, or manure applied to the field, the greater the chance of nitrate poisoning to livestock. Also, be very careful about pigweed, lamb's quarter and other weeds present in that field, they may also be very high in nitrates.

**MANAGEMENT OPTIONS OTHER THAN MAKING SILAGE FROM HAIL DAMAGED CORN**

**Q: What benefit could I expect by turning the residue back into the soil?**

A: Corn with a 200 bushel yield potential at the silk or brown silk stage has taken up around 90% of the nitrogen for the growing season, along with 30% of phosphate, 90% of the potassium, 75% of the magnesium and 75% of the sulfur needs. Therefore, if you decide to shred this crop down, and work the residue into the soil, you will be turning most of these nutrients back to the nutrient cycle. A very accurate soil sample will be very important next year to take advantage of these unused nutrient levels.

**Q: What is the best practice for destroying this crop?**

A: Use of the stalk shredder should be used to reduce the plant particle size to a more manageable level. Reducing particle size will help speed decomposition and make tillage incorporation easier.

**Q: What about fall tillage?**

A: This would be an excellent opportunity to do some tillage operations like, deep subsoiling or surface chiseling, provided the ground dries out to the degree that will allow these operations. This will also return your crop residue back for decomposition into the nutrient cycle. However, under dry land conditions, that stalk may want to be less standing to allow for more snow catch.

**Q: What about soil surface crop residue?**

A: You'll be allowed to do any type of tillage operation if you are not on highly erodible soils. If you are under a conservation plan or highly erodible soils, then you must follow your plan or make arrangements with the ASCS as to what options you have.

**Q: Can I plant a crop to graze?**

A: Rye, wheat or oats (small grains) may be your best options if you want a crop to graze. However, if the field has had high levels of nitrogen applied, you can run the risk of nitrate problems here also. A sorghum-sudan will be a concern with nitrate and possible prussic acid levels.

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