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Corn & Soybean Science Newsletter

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Cooperating Departments: Agricultural Economics, Biosystems and Agricultural Engineering, Entomology, Plant and Soil Sciences, Plant Pathology
Editor: Chad Lee

In this Issue:

1. Harvesting Flood Damaged Corn for Silage or Grain

Chad Lee and Jim Herbek, Plant and Soil Sciences, and Donna Amaral-Phillips, Animal and Food Sciences

Stalk Deterioration

Corn stalks often deteriorate rapidly after flooding. Corn plants will survive submerged conditions for about 24 hours when soil temperatures are higher than 70 degrees F (Thelen, 2001). Water that has been over corn for more the 24 hours will likely kill the corn plant and weaken the stalk.

Mold to Corn Ear

Corn ears submerged in the water can develop mold. Moldy corn is often not accepted at elevators or is heavily docked. Aflatoxins and fumonisins are often associated with moldy corn. Fumonisins are the most prevalent mycotoxin in corn in this part of the United States (Vincelli and Parker, 2002).

All moldy corn should be sampled and tested for fumonisin before shelling and/or feeding to livestock. Contact your county extension office for more information about where testing is possible. Corn samples that will not be tested for 12 to 24 hours should be dried to 16% moisture. Corn kernels at higher moisture levels will cause the fuminosin to increase in the sample, which will result in a falsely high report. The laboratories in below will conduct fumonisin tests. Call the laboratory prior to shipping the sample for specific guidelines on sampling.

A & L Laboratories
411 North Third St.
Memphis, TN 38105
(901) 527-2780
(800) 264-4522

Iowa Testing Laboratories, Inc
Highway #17 North,
P.O. Box 188
Eagle Grove, IA 50533-0188
(515) 448-4741
Fax: (515) 448-3402

Breathitt Veterinary Center
Murray State University
P.O. Box 2000
715 North Drive
Hopkinsville, KY 42241-2000
(270) 886-3959
Fax: (270) 886-4295
(Samples must be submitted by a veterinarian only from KY)

UK Grain Quality Testing Lab
Attn: Michael D. Montross
Biosystems & Agricultural Engineering
128 Barnhart Bldg.
University of Kentucky
Lexington, KY 40546-0276
Voice: (859) 257-3000 x106
Fax: (859) 257-5671
Email:montross@baeuky.edu
(KY farmers only)

Use the fumonisin levels reported from the laboratory and the information in Table 2 to determine if the corn can be fed to livestock. Corn that cannot be fed to livestock will likely not be accepted by grain elevators. Scouting the field and sampling the grain prior to harvest will help the producer determine if the field should be harvested.

Table 1. *Maximum levels of fumonisins in corn and corn by-products recommended by the U.S. Food and Drug Administration (November 9, 2001): Adapted from Vincelli and Parker (2002).*

Animal Feeds	**Total Fumonisins (FB1+FB2+FB3)**
Equids (equine) and rabbits	5 ppm (no more than 20% of diet)*
Swine and catfish	20 ppm (no more than 50% of diet)*
Breeding ruminants (including lactating dairy cows) and breeding poultry (including hens laying eggs for human consumption)	30 ppm (no more than 50% of diet)*
Ruminants greater than or equal to 3 months old being raised for slaughter	60 ppm (no more than 50% of diet)*
Poultry being raised for slaughter	100 ppm (no more than 50% of diet)*
All other species or classes of livestock and pet animals	10 ppm (no more than 50% of diet)*

*Dry weight basis.

Sprout in the ear
Some elevators will dock sprouting in the ear. While the sprouting, itself, is not a danger to livestock, sprouting in the ear is often associated with moldy corn kernels.

Harvest options
Silage
Once the damaged corn plants have been scouted for moldy ears, mycotoxins (if moldy), sprouting ears and weakened stalks and the crop is deemed worthy of harvest, then harvest can begin. Optimum plant moisture is 30 to 35% dry matter (65 to 70% moisture) for ensiling, depending on storage structure. Corn plants that have less moisture will not ensile as well and can result in a lower quality feed.

Plants covered with mud can increase the iron content of the ensiled silage. Once the crop has fermented for 3 to 4 weeks, the ensiled feed should be analyzed for its nutrient content. This analysis should be done using wet chemistry methods so that the iron and other trace mineral content of the silage can be determined. Higher concentrations of iron in the silage can increase the cattle's requirements for copper and other trace minerals which are important in their health. Farmers should work with their nutritionists to make sure the proper mineral balance is provided through the mineral and/or grain mixture.

Grain
Once the damaged corn plants have been scouted for moldy ears, mycotoxins (if moldy), sprouting ears and weakened stalks and the crop is deemed worthy of harvest, then harvest can begin. The stalk strength will be low and the corn should be harvested as soon as possible once the grain moisture is at or below 25%. Harvesting the corn at 25% and immediately drying the grain to a moisture at or below 16% will reduce the

spread of fumonisin in the sample.

High moisture corn (corn grown specifically to be harvested at high moisture and fermented for cattle feed) should be analyzed for mycotoxins before storage or feeding. Flooded high moisture corn should be stored in separate, temporary structures such as bags to avoid possible contamination of permanent storage structures.

Grazing
Corn that is lodged, but has been determined safe for animal consumption can be grazed by cattle. Strip grazing will improve the harvest efficiency of the cattle, but will require more fencing and slightly more labor. Cattle should be monitored closely when first put into a field of corn to graze. Be sure to have an ample water supply and mineral supplements.

Too Damaged for Harvest
If the fumonisin levels in the corn are too high for livestock consumption and/or the forage quality to poor for ensiling, then reporting a crop loss to your crop insurance agent may be your only option remaining. Once an agreement has been reached with the insurance agent, the remaining crop should be destroyed with a mower or plowed under to hasten breakdown of plant material and reduce pathogen inoculum levels for corn the following year.

Cited Resources:
Thelen, K. 2001. Managing corn and soybean fields submerged by recent heavy rains. Field Crop Advisory Team Alert. Vol. 16 no. 6. http://www.ipm.msu.edu/CAT01_field/FC05-17-01.htm

Vincelli, P. and Parker. 2002. Fumonisin, vomitoxin, and other mycotoxins in corn produced by *Fusarium* fungi. ID-121. Univ. of Kentucky Cooperative Extension Service.

Other Sources:
Penn State
Managing Flood Damaged Crops (corn silage, corn and soybeans)
(Greg Roth, et al. 2006)
http://cornandsoybeans.psu.edu/flood_damaged_crops.cfm
and
Management of Pre-Harvest Flood Damaged Corn and Soybeans
(Tom Murphy, et al. 2005)
http://crops.confex.com/crops/2005am/techprogram/P4612.HTM

The Capital-Journal (Topeka, KS) article from Oct. 2005 that quotes a farmer ("I have a $500 repair bill from the dirt" (for combine/bearings after harvesting flood-damaged soybeans).
http://findarticles.com/p/articles/mi_qn4179/is_20051114/ai_n15855697

Texas A&M AgNews (Dec. 10, 2002)
"Cold weather and flooding in some areas have caused Southeast Texas farmers to wrap up their soybean harvest, leaving soybeans in the field due to damaged pods and moisture content, said Dale Fritz of Bryan, district Extension director."
http://agnews.tamu.edu/dailynews/stories/CROP/Dec1002a.htm

2. Flooded Soybeans Near Harvest

Chad Lee and Jim Herbek, Plant and Soil Sciences, Don Hershman, Plant Pathology and Sam McNeil, Biosystems and Agriculture Engineering

Soybeans in several areas of Kentucky received excessive rain and were submerged either partially or completely. In most cases, the soybeans had reached maximum seed weight and were drying down for harvest.

Determining yield losses from flooded, mature soybeans is extremely difficult and no accurate prediction will likely be made. We know that flooding is not a good thing for soybeans, we just can't say how bad it may be. Below are several things that could occur along with suggestions on management.

Possible Scenarios from Flooding

1. Sprouting in the pod. Soybean seeds that have dried below 50% moisture and imbibe water to rise back above 50% moisture can germinate. Aside from getting the water off of the field as quickly as possible, there is nothing a farmer can do to prevent the germination of seeds in a pod.

2. Shattering. Once these plant dry out again, shattering of the pods is a very good possibility. With the thought of shattering, most farmers will be tempted to harvest these soybeans as soon as the seeds have dried enough for harvest. Harvesting these soybeans early must be weighed against some of the other things that might occur in the field.

3. Saprophytic fungi. The moist, dead soybean plant material is a good host to saprophytic fungi. These could discolor some soybean seeds. They could cause clouds of black dust during harvest. Scout the fields to see if the fungus has gotten to the seeds. If the fungus is not on the seed, then you may want to harvest these as soon as possible to prevent any additional seed damage. If the seeds have been infected with a fungus, then deciding when to harvest becomes more difficult. Some of the other scenarios presented here may help in that decision. These soybeans should be kept separate from soybeans harvested from dry or clean fields.

4. Lodging of plants. This lodging most likely will occur from the rapid movement of water into or out of the field. These plants will likely be covered in mud and silt, so some seeds will be lost to the ground. The remainder will be difficult to harvest. Lodged plants in contact with the soil or covered with mud, silt and debris will probably result in increased deterioration of the seed and poor seed quality. The farmer cannot prevent these soybeans from lodging. Harvesting will be very slow and harvest losses are very likely in this situation.

5. Silt and mud. Flooding brings water and soil. As the water recedes, the soil is left on the plant material. The silt can delay drying out of the plants and will create some very dusty soybeans at harvest. Moreover, it will cause extra wear and tear on the combine harvesters. If the soybeans are standing and the farmer can wait, it would ideal to harvest these soybeans last, so as to keep the combine relatively clean for fields of soybeans that were not flooded. .

6. Grain Quality. Monitor each field for grain quality prior to harvest. Flooded fields will most likely have reduced seed quality affecting marketability. Depending on the extent of damage, this may result in heavy dockage or unacceptability at elevators.

7. Soybeans not Mature. Late planted soybeans that had not reached physiological maturity (R7) and were flooded for more than 24 hours, will most likely not survive, resulting in pre-mature death of the plants. In these cases, you can expect reduced seed quality (green and off-color seed, shriveled and smaller seed). The extent of seed quality damage will be dependent on the plant reproductive stage when flooding occurred. Fields with considerable green foliage (R5 to early R6) would be of greatest concern for reduced seed quality. Monitor each field to determine if harvest is a feasible option.

Suggested Management
1. Separation. Soybean seeds harvested from flooded fields should be kept separate from soybeans harvested in other fields. Seed quality may be reduced in flooded fields. Mixing soybeans from flooded fields with soybeans from dry fields could reduce the quality of the overall load of soybeans.

2. Harvest order. Above are some conflicting situations on when to harvest flooded soybeans. On the one hand, flooding will probably increase lodging and shattering. Both are reasons for harvesting the fields as soon as possible. On the other hand, dust and silt are reasons for harvesting these fields last. Fungi, depending in the severity could go in either category. Final harvested yield in flooded soybean fields is likely reduced; we are not sure by how much. Harvesting flooded soybeans could take longer, especially if plants have lodged, are muddy or dusty from silt and/or fungi. If multiple fields of soybeans are ready to harvest at the same time, consider harvesting the better, dry fields first. Harvest yield losses were not reduced in these fields and they can be harvested quicker than the flooded fields.

3. Heavily damaged fields. For soybean fields that received extensive flood damage and will likely result in considerable harvest yield losses or very poor seed quality, then pursuing crop insurance claims (if it is an option), may be the best choice.

4. Scout the fields. To determine the extent of flood damage and harvest order, these fields will need to be scouted. Deciding which fields to harvest first will depend on the situation for each farmer. County extension agents are available for help in making these decisions.

Related Information:
Penn State
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http://agnews.tamu.edu/dailynews/stories/CROP/Dec1002a.htm

Ohio State
Flooding Injury to Soybeans – Anne Dorrance, 2006
http://corn.osu.edu/index.php?setissueID=140
from article by Matthew Sullivan, et al. in Crop Science Society of America (41:91-100, 2001)
http://crop.scijournals.org/cgi/content/full/41/1/93

3. Storing Flood Damaged Soybeans and Corn

Sam McNeil, Biosystems and Agriculture Engineering

Damaged corn should be stored separately from other corn. The same for damaged soybeans. If this is not possible, then check the corn for mycotoxins prior to storing it.

For undamaged soybeans in KY we recommend moisture levels of 13, 12 and 11 % for winter, spring and summer storage, respectively. For corn the corresponding levels are 15, 14 and 13%.

The rule of thumb for weather damaged grain is that it should be held at 1 to 2 points below normal for the appropriate storage period. For example, damaged corn stored this winter should be at 13 to 14% moisture. With beans at $6.00, shrink cost is 6.8 cents per bushel for each point below the market level of 13.0%. For corn at $2.50 per bushel, shrink is 2.9 cents per bushel for each point below the market level of 15.5%.

Of course, drier grain will certainly store better so this is a good management decision to control further damage during storage...and can be the least cost option when weighed against potentially heavy elevator discounts. Also, damaged grain should be cooled to 40 degrees as soon as possible this fall and kept cool to help control storage problems/risk.

Lastly, damaged grain should be checked more often so that any storage problems can be caught early and managed by running the fan or moving the grain to a separate storage bin. Damaged corn should not be fed to livestock without first checking for mycotoxin levels and nutrient content by an appropriate lab.

More information regarding flood damaged corn and soybeans will be made available at : http://www.uky.edu/Ag/GrainCrops/

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