Management of Molds and Mycotoxin During Grain Storage

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Where are the Critical Control Points for Molds & Mycotoxins?
PREHARVEST

Ear Rots
Weather Extremes
Insect Damage

Rain during flowering
75-85 F

DON
Zearalenone

Aflatoxin
Fumonisin

Drought/Heat
Insect damage
Scout fields before harvesting

• Be aware of ear rot problems BEFORE harvest
  – Prioritize harvest and designate storage
  – Determine if grain needs to be tested for mycotoxins
Storage
Storing Grain

- How long can I store damaged grain?
  - Move damaged grain as soon as possible

- Will storing grain reduce mycotoxin levels?
  - Mycotoxins are extremely stable
  - Storing will not reduce levels, but if stored at appropriate conditions, mycotoxin levels should not increase
Testing for Mycotoxins

Bright Green Yellow Fluorescence (BGYF):
A presumptive test for aflatoxins
Testing for Mycotoxins

- Test Kits
- ELISA
- HPLC Trace
Mycotoxin Analysis

Routine testing is available for:
• Aflatoxins
• Trichotheccenes (DON, T-2)
• Zearalenone
• Fumonisins

Neogen Corporation
Romer Labs, Inc.
Vicam, LP
EnviroLogix
Charm Science
Pre-Cleaning

Gravity Cleaner

Aspirated Cleaner

Rotary Cleaner
Conditions that Contribute to Spoilage of Grain

- Degree which the grain is invaded by mold
- Amount of broken kernels and foreign material
- Temperature of the grain
- Moisture content of the grain
Managing Grain in Storage

• Cool grain into mid-30° F range
• Fines and foreign material restrict air flow and lead to hot spots or areas of uncooled grain in bins
• Check and core bins if necessary
Leakage

Poor Storage Conditions
Blue Eye Damage
Moldy Grain Attracts Mold-Feeding Insects
Hairy Fungus Beetle
Foreign Grain Beetle

Steve Jacobs
PSU Entomology

SINGLE TOOTH EACH SIDE.
Impact of Mold

Each fungal species has its own moisture preference

- **Field Fungi**
  - Grow best under **high moisture** conditions
  - Do not grow well or compete well under dry storage conditions

- **Storage Fungi**
  - Adapted to grow under **low moisture** conditions
  - Normally invade kernels after harvest
  - Generate heat and moisture as they grow
Eurotium spp.
Storage Mold

Fusarium graminearum
Field Mold

Aspergillus flavus
Field/Storage Mold

Moisture

High  Low  Very Low
# Time of Storage (Corn)

<table>
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<th>Temperature (°F)</th>
<th>Grain Moisture (%)</th>
<th>Months</th>
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Summary

• Evaluation of ear rot diseases before harvest:
  – Allows time for planning harvest
  – Provides indication of potential mycotoxin issues
  – Allows time for planning storage

• Once corn is shelled, determining the cause of damage or the presence of mycotoxins requires testing.
  – Plating to identify fungal species
  – Chemical analysis to test for mycotoxins
Storage Surveillance

• Mycotoxin Analysis
  – Immuno-assays
  – HPLC/GC/MassSpect

• Monitor
  – Temperature
  – CO2
  – Volatiles
  – Mold Species
CO$_2$ SENSORS

Ileleji et al., 2006
CO₂ SENSORS

Ileleji et al., 2006
The earliest possible spoilage detection enables early decision-making when the least amount of inventory is affected. This is a huge economic advantage over the current status quo where spoilage is all too often detected late in its development, requiring expensive mitigation action that involves a large fraction, or all, of the bin inventory. With early warning from Binspector-CO2, you will trim spoilage losses from many thousands of bushels per incident down to just a few hundred or even zero bushels, saving thousands of dollars with each detection.

Patent Pending

www.gsiag.com

BinTech

TOTAL VALUE SYSTEMS.