Stalk Rots & Lodging in Corn

Bob Nielsen
Purdue University
Email: rnielsen@purdue.edu
Web: www.kingcorn.org

Image source: Nielsen, Purdue Univ.
Outline

- Methods of infection
- Fungal causes
- Relationship with plant stresses
- Ways to minimize stalk rot risk

Acknowledgements:

G. Shaner, Purdue Univ.

L. Sweets, Univ. of Missouri

P. Lipps, Ohio State Univ.

G. Munkvold, Iowa State Univ.
Several fungi often involved

- All are part of the complex of microorganisms in the soil that decompose dead plant material.
- Survive from one season to the next in
  - The soil, or
  - Infested corn plant residues
Entry into the corn plant

- Fungal spores blown into base of leaf sheath germinate and grow directly into the stalk tissue
- Fungal spores enter directly through wounds (hail, ECB, mechanical injury)
- Infect root system directly, causing root rot, later stalk rot

Image source: Nielsen, Purdue Univ.
Fungal causes

- **Anthracnose** (*Colletotrichum*)
  - Usually most evident at stalk nodes
  - Lesions initially tan to reddish-brown, but become shiny black later in the season
  - Stalk pith may also be discolored and may disintegrate later in the season
  - Often also associated with ‘top die-back’ of corn plants during grain filling period.

Image source: Yang & Munkvold, Iowa State Univ.
Fungal causes (II)

- Fusarium & Gibberella
  - Similar in-field symptoms
  - Pink to red discoloration of diseased tissue
  - Small amounts of white mycelium may be visible at diseased nodes
  - Stalk pith usually shredded & discolored

Image source: Nielsen, Purdue Univ.
Fungal causes (III)

- **Diplodia**
  - Begins as brown to tan internode discoloration
  - Stalk pith disintegrates, leaving only the vascular tissues
    - Mats of white fungal growth often visible on diseased plant tissue
    - Small black fruiting bodies may be evident
  - Last year’s ear rot outbreak left a lot of inoculum for this year.

Image source: Munkvold, Iowa State Univ.

Image source: Nielsen, Purdue Univ.
A disease of ‘old age’

- Fungi typically don’t infect corn at early stages of development.
  - Yet, fungi are present in soil and plant residues 12 months out of the year.
- Rather, develop at mid-to late grain fill stages
  - Early August to early September
Why ‘old age’ disease?

- Young, healthy roots and stalks are fairly resistant to fungal infection.
- Susceptibility to rots increases as ...
  - Cell maintenance & repair diminishes due to lack of carbohydrate replenishment
  - Carbohydrates remobilize from stalk tissue to fulfill demands of developing ear
  - The incidence of both increases during the course of grain fill
Carbohydrate availability

- For most of today’s corn hybrids, the carbohydrates necessary for the grain filling process are manufactured ‘on the fly’ by photosynthesis.
  - If the photosynthetic ‘factory’ is hindered by plant stresses, carbohydrate output will also be restricted.
Photosynthetic stresses

- Any plant stress occurring any time during the season can affect the photosynthetic productivity of the plant ‘factory’ during grain fill.
  - But, especially stresses that occur during the grain fill, including
    - Hail, leaf diseases, cloudy conditions, soggy soils, dry soils, extreme heat, nutrient deficiencies, ECB or SWCB infestation
Plant's response to stress?

"When the carbohydrate demands of the plant cannot be met by the photosynthetic output of the 'factory', plant may cannibalize carbohydrate reserves stored in lower stalk tissue. Developing ears take priority and root & stalk cell maintenance suffers. Fungal infection of roots (root rots) soon follows when the carbohydrate demands of the plant cannot be met by the photosynthetic output of the 'factory'."
Cannibalization

- Refers to the remobilizing of stored carbohydrates from stalk tissues and transport to the developing ear.
  - Weakens the physical integrity of stalk
  - Increases susceptibility to stalk rots
- Especially likely when plant stresses occur
  - From early to mid-grain fill and/or
  - When potential ear size (yield) is large
Plant stresses this year?

- High yield potential itself
- Excessively dry soils at times
- Excessively wet soils at times
- Periods of cloudy weather
- European or SW Corn Borer infestations
- GRs, anthracnose, NCLB
- Some leaf diseases, especially late GLS, anthracnose, NCLB
Good corn yields this year?

- Highest statewide yields ever!

Indiana Corn Grain Yield Since 1930

Data Source: Indiana Agricultural Statistics Service

\[ y = 1.6237x - 3109.2 \]
\[ R^2 = 0.892 \]

Trend line yield for 2001 = 138.6 bu/ac
Est. yield for 2001 = 160 bu/ac (as of Oct 1)
Minimizing risk of stalk rots

- Hybrid selection
- ‘Stay-green’ trait infers less cannibalization
- Stalk strength characteristics
- Disease tolerance, esp. leaf diseases
- Bt trait where ECB or SWCB are prevalent
- Stress tolerance in general
- Avoid excessively high populations
Minimizing risk of stalk rots

- Minimize risk of stress
  - Always use best agronomic practices
  - Avoid/alleviate soil compaction
  - Avoid nutrient deficiencies
  - Attend church regularly!

- Avoid continuous corn rotation
  - Residue conducive for inoculum development

- Use tillage where appropriate
  - Esp. helps avoid diplodia and anthracnose
Late-season scouting

- Beginning in early August, scout fields or areas within fields that are likely to be at high risk for stalk rots
  - Susceptible hybrids
  - Severe drought or soggy soil stress
  - Severe nutrient deficiency
  - Severe insect or leaf disease infestations
  - Exceptionally high yields

Read your newsletters:
Nielsen, P&C Newsletter, 16 Aug 2001
Late-season scouting

- Pinch or slice lower stalks for evidence of disintegrating stalk tissue
- Dig up plants and inspect roots for health and integrity
- Schedule high risk fields for early harvest
- Continue scouting during harvest
  - Stalk health condition can change rapidly
    - Gibberella stalk rot favored by October rainy period 2001
Stay informed ...

Down at the ...
Chat 'n Chew Café
http://www.kingcorn.org/cafe

Timely information on the Web for Eastern Corn Belt corn & soybean farmers

(c) 2001, RLNielsen, Purdue Univ.