ARE NORTHERN SOYBEANS CATCHING A WAVE OF SOUTHERN SOYBEAN DISEASES?

Best of the Best in Wheat and Soybean Research. 2020
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WHAT’S NEW, WHAT’S CHANGING, WHAT’S IMPORTANT, AND WHY?

WHY ARE NEW PROBLEMS EMERGING?

- Changing summer weather patterns. 
  \textit{More rain \& humidity = greater disease risk}
- More global travel and trade
- New varieties and hybrids
- Changes in rotation and cropping systems
- Time - - - - -
- And - many unknowns
Soybean Diseases

- **Frogeye leaf spot** *(1st reported 1915 in Japan)*
- **White mold** *(observed widely since late 1800’s)*
- **Sudden death syndrome** *(1st report 1971 in AR)*
- **Brown stem rot** *(1st reported 1940’s in Illinois)*
FROGEYE LEAF SPOT (FLS)

- Historically uncommon in MN
  - Increased in 2018 and 2019

- Reached ‘high’ levels in a few MN fields - 2019

- Management complicated by QoI (strobilurin) fungicide resistance in FLS fungal pathogen
  - Resistance confirmed in 15 states (including MN in 2019)
SYMPTOMS OF FROG EYE LEAF SPOT

- Brown leaf spots surrounded by a darker reddish-brown or purple ring
- Centers of spots become tan as they age and develop black specks
- Spots may coalesce, fall out and kill large parts of leaves

Photo by D. Malvick
FROGEYE LEAF SPOT

- Yield losses up to 30% reported in the southern U.S.
- Favored by warm & humid weather
Counties with confirmed QoI (strobilurin) fungicide resistance in 2019
MANAGING FLS

- Plant resistant soybean varieties *(if available)*
- Crop rotation and tillage
- Foliar fungicides
  - No definite threshold for FLS, but growth stage, disease level, and variety susceptibility important.
  - R3-R4 appears to be optimal timing
  - Use fungicide products that contain active ingredients from different fungicide classes for efficacy and resistance management. See “Crop Protection Network” web site for more information.
WHITE MOLD
Gall Midge that Feeds on White Mold

Karshomyia cauli cola (WGM) larvae and white mold mycelia inside a soybean stem. Photo: Joseph Moisan-De Serres.

Resselliela maxima (soybean gall midge) larvae and damage under the epidermis of a lower soybean stem. Note the dark discoloration and the lack of white mold mycelia.

Photos: A. Sisson and D. Mueller

Source: MN Crop News 10/2/19, Koch et.al.
WHITE MOLD - WHAT’S NEW?

- Low resistance to white mold in some Xtend® soybean varieties

- This has been noted in MN and surrounding states, and has been summarized in a Crop Protection Network report:

  ![Crop Protection Network Report](Source: Mueller et.al. doi.org/10.31274/cpn-20190621-000.)

Photos: A. Sisson and D. Mueller
WHITE MOLD RISK FACTORS

- High moisture and humidity during flowering
- Cool temps. (60-75°F) during & after flowering
- High plant populations
- High fertility – especially manure
- Field with history of white mold
WHITE MOLD OF SOYBEAN

Managing Risk and Minimizing the Disease

Four Main Messages

1. Know your fields & the white mold risk in each one
2. Pick the most resistant soybean varieties –
3. Reduce planting density and increase row width (if feasible)
4. Consider fungicide applications when rows are filling and risk is high (based on weather, crop conditions, & possibly app)

Others: Contans®, irrigation management, reduce fertility, etc.
Sudden Death Syndrome (SDS)
Caused by the soilborne fungus *Fusarium virguliforme*

Photos by D. Malvick
SUDDEN DEATH SYNDROME (SDS)
SDS RISK FACTORS

✓ Presence of pathogen & field history of SDS
✓ Compacted soil, poor drainage
✓ High SCN populations
✓ Susceptible soybean varieties
✓ Wet soil 2-3 weeks after planting
✓ Periodic heavy rain through mid-July and moist soil through mid August
SCOUTING FOR SDS

- **When**: begin looking first week of August
- **Where**: often but not always appears first in low, poorly-drained, or compacted areas
- **What to look for**: yellow, diffuse spots on leaves
SDS Recognition and Diagnosis
Sudden Death Syndrome (SDS) vs. Brown Stem Rot (BSR)

Photos by D. Malvick
First Report of Sudden Death Syndrome of Soybean Caused by Fusarium virguliforme in North Dakota


In August 2018, soybeans (Glycine max L.) were observed with symptoms of sudden death syndrome in Richland County in southeast North Dakota. In the field of 65 ha, plants in about 8 ha showed leaf symptoms consisting of interveinal chlorotic spots and coalesced spots that became necrotic with the leaf veins remaining green. Some plants had misshaped leaves, and many plants were stunted. Roots showed extensive brown discoloration and decay. Symptomatic plants were collected from 10 sites in...
MANAGING SDS

#1 Scout for SDS beginning in early August
#2 Resistant Varieties – EFFECTIVE
#3 Specific seed treatment fungicides
  > ILeVO® (BASF) and Saltro® (Syngenta)
  > Heads-Up also labeled for SDS –

Note: Dry edible bean (kidney, black, and pinto) also confirmed to be susceptible to the SDS pathogen
BROWN STEM ROT (BSR) IN SOYBEAN

Photos by D. Malvick
BROWN STEM ROT (BSR) CAN CAUSE YIELD LOSSES EXCEEDING 30%, BUT YIELD LOSSES IN THE 10 – 20% RANGE APPEAR MORE COMMON
DIAGNOSIS OF BSR

- **Stem Symptoms**
  Similar: BSR, Stem Canker, Pod and Stem Blight

- **Leaf Symptoms**
  Similar: BSR, SDS, sometimes white mold

- **Laboratory**
  Symptoms and DNA test or isolation of pathogen
KEY POINTS: BROWN STEM ROT

- Risk increases with increased years of soybean production
- Symptoms often most severe when:
  > Cool temp. (<80°F) & wet soil, flowering to pod fill (R1- R6)
  > Dry Soil during maturation (R6 - R8 stages)
- Enhanced by SCN
- Symptoms often not visible on leaves
- Stems must be split to diagnose
- Manage with crop rotation and resistant varieties
Soybean Diseases

- Frogeye leaf spot
- White mold
- Sudden death syndrome (SDS)
- Brown stem rot (BSR)
- AND OTHERS!
CROP PROTECTION NETWORK

SOYBEAN DISEASE MANAGEMENT

Sudden Death Syndrome

Soybean sudden death syndrome (SDSS) is the most economically significant disease of soybean in the United States. SDSS is caused by the soil-borne fungal pathogens Fusarium solani and F. oxysporum. Symptoms of SDSS typically appear in the upper leaves of soybean plants, starting from the top and working their way towards the bottom. The disease can cause stunted plants with yellowing leaves, reduced biomass, and lower yields.

Symptoms and Signs

Active Symptoms

The early symptoms of SDSS are typically observed on the newly emerged leaves. These symptoms include yellowing, wilting, and necrosis. The leaves may curl or become dry and brittle. As the disease progresses, the symptoms may spread to other parts of the plant, including the stems and roots.

Preventative Measures

To prevent SDSS, farmers can采取以下措施:

1. Rotate crops:
   - Growing non-host crops in the field can help reduce the disease pressure.
   - Intercropping with corn can also help reduce the spread of the disease.

2. Soil management:
   - Improving soil health through organic amendments can help reduce disease pressure.

3. Crop hygiene:
   - Regularly removing dead and infected plant material can help reduce the disease spread.

Resources

For more information on SDSS management, visit the Crop Protection Network website at https://cropprotectionnetwork.org/.
WHAT IS OVER THE HORIZON (OR CLOSER)?

- Changing weather patterns & crop varieties lead to changes in soybean diseases and their risks.
- We don’t know what disease risks are over the horizon and around the bend.
- Meanwhile don’t ignore established problems:
  - White mold, BSR, Phytophthora rot, SCN, etc.
- Which diseases should you manage for?

Watch, Look, Listen, and Read

Photo: Liz Stahl
Questions or comments?

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