Foliar Fungicides for Control of Soybean Rust – How do they actually work?

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Key Terms for Fungicides

- Non-systemic
- Locally systemic
- Systemic

Key Terms for Fungicides

- Preventative
- Curative
- Eradicant
- Antisporant

- (definitions from Jim Frank, Syngenta)

Preventative Fungicides

- "Prevents the establishment of an infection on the host crop"

Curative Fungicides

- " Interrupts the development of an established infection which is not showing visible disease symptoms on the plant"

Eradicant Fungicides

- "Interrupts the development of an established infection which is showing visible disease symptoms on the plant"

Antisporant Fungicides

- "Prevents the fungus from producing spores or decreases spore production without stopping the vegetative growth of the pathogen"

1. Preventative Fungicides

- Chemical barrier
- Not absorbed or translocated
- Present before infection
- No "kick-back" activity
- Affected by environment
- Coverage is critical
- Insurance

Inorganic Fungicides

- Sulfur (elemental)
  - Blocks enzymes and stops respiration
  - Limited spectrum
  - Multi-site mode of action
- Mercury Compounds
  - Environmental concerns
  - Vapor action-systemic (smuts)

Organic Fungicides

- Organometallics
- Dithiocarbamates
- EBDC
- Phthalimides
- Substituted benzenes
- Phenylpyrroles

Organometallics

- Copper sulfate
- Bordeau Mixture
- Wide spectrum
- Prevents spore germination
- Multi-site mode of action

Dithiocarbamates

- Protectant
- Thiram (seed treatment)
- Multi-site mode of action
- Interferes with oxygen uptake
- Inhibits sulfur-containing enzymes
- Causes allergic reaction
- Low risk of resistance

EBDC's

- Maneb, mancozeb
- Common foliar fungicide
- Parent product is not active
- Degrades to cyanide (active)
- Low risk of resistance

Substituted Benzenes

- PCNB (one ingredient in Rival)
- Broad spectrum
- Lyses mitochondria membranes
- May inhibit several enzymes
- Low risk of resistance

Phthalimides

- Captan
- Broad spectrum
- Multi-site action
- Degrades to thiophosgene
- Inhibits several enzymes
- Low risk of resistance
- Captan was RPAR'd in 1980

Phenylpyrroles

- Maxim (fludioxonil)
- Broad spectrum
- Affects membrane transport
- Low risk of resistance
- Very low use rates

2. Curative Fungicides

- Can “cure” an infection
- Systemic ???
- Coverage is not as critical
- Has ‘kick-back” activity
- Works better with scouting
- Resistance management is important

Benzimidazoles

- Benlate (benomil)
- Broad spectrum
- Systemic
- Doesn’t affect oomycetes
- Inhibits beta-tubulin
- High risk of resistance

Phenylamide

- Apron XL (mefenoxam)
- Allegiance (metalaxyl)
- Systemic
- Inhibits RNA synthesis
- Controls oomycetes
- High risk of resistance

Sterol Inhibitors

- Triazoles
- Strobulins
- Benzathiadiazoles

Triazoles

- Tilt, Folicur, Dividend
- Broad spectrum
- Inhibits sterol biosynthesis
- Single-site mode of action
- Higher risk of resistance

Strobulin's

- Quadris, Headline, Flint
- Several new ones are coming
- Disrupts electron transport system (ETS)
- Systemic (xylem only)
- Higher risk of resistance??

Benzathiadazoles

- Actigard (SAR inducer)
- Spectrum unknown, but control many fungal pathogens
- Stimulate natural resistance systems

Soybean Rust

- Highly aggressive pathogen
- No high level resistance in US germplasm
- May require fungicides for control

Labeled for soybean rust

- Quadris (azostrobin)
- Bravo or Echo (preventative)

Section 18 Products…..

- propiconazole (Tilt)
- tetraconazole (Folicur)
- myclobutanil (Laredo)
- propiconazole+trifloxystrobin (Stratego)
- tetraconazole (Domark)
- pyraclostrobin (Headline)
- pyraclostrobin+boscalid (Pristine)