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
- Bordeaux 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

Phenylpyrrololes

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