

Soybean-Canola Rotation: Why Not? A Pathologist's Perspective

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Top 6 Disease Issues in Soybean*

1. Soybean Cyst Nematode
2. Seedling Disease (*Fusarium*, *Rhizoctonia*, *Pythium*)
3. Sudden Death Syndrome
4. Sclerotinia stem rot (white mould)
5. Phytophthora Root Rot
6. Septoria Brown Spot

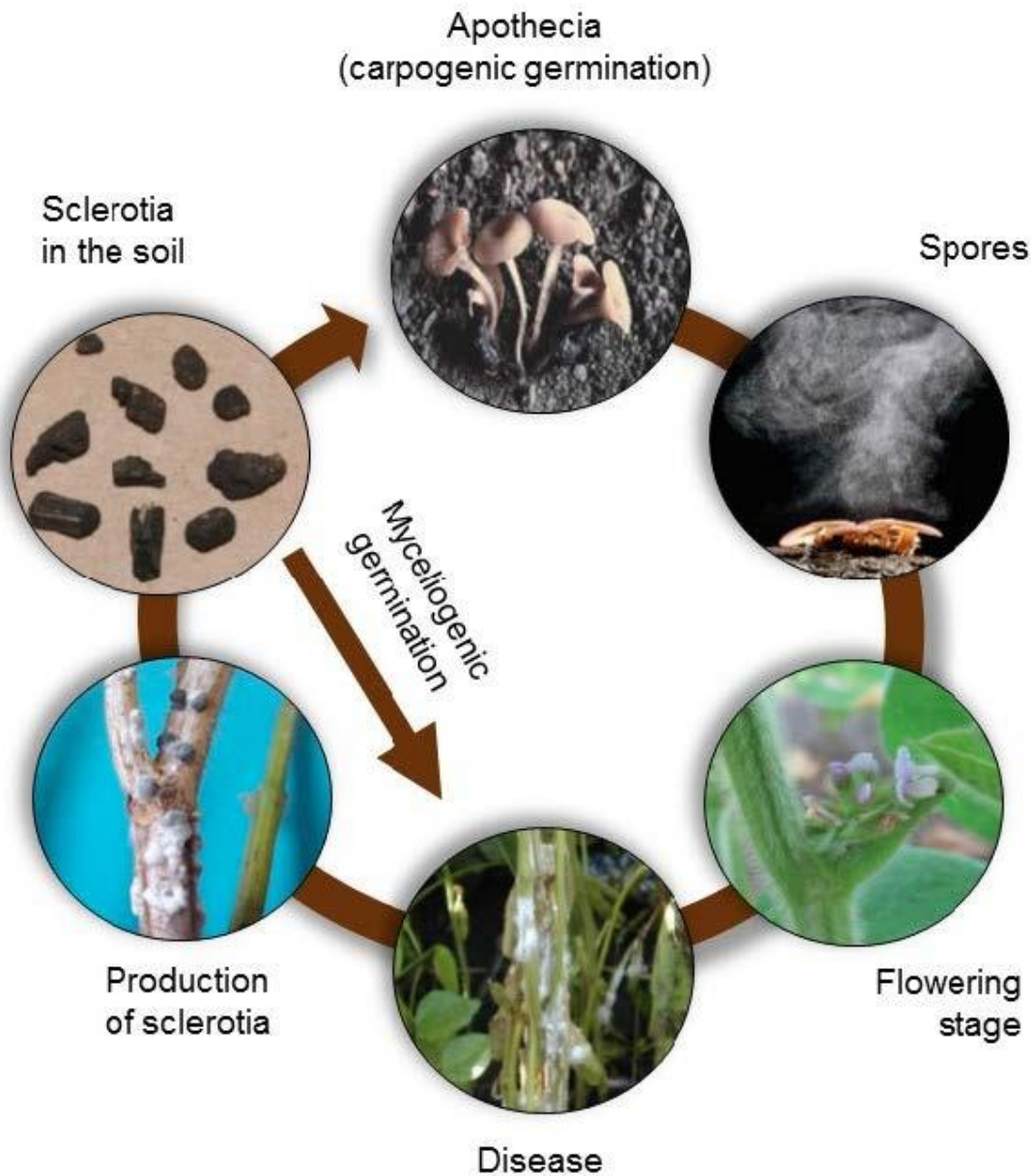
Top 6 Disease Issues in Canola

1. Clubroot
2. Sclerotinia
3. Blackleg **Verticillium wilt/stripe?**
4. Root Rot/Foot Rot/Seedling Disease
(*Fusarium*, *Rhizoctonia*, *Pythium*)
5. Alternaria Pod Spot
6. Aster Yellows

Two Major Common Denominators

- **Sclerotinia stem rot/white mould**
- **Causal agents of root rot/seedling disease**
 - *Fusarium* spp., *Rhizoctonia* spp., & *Pythium* spp.

White Mould/ Sclerotinia Life Cycle



Symptoms - canola



Symptoms - soybean



Management - canola

- **Know your risk**
 - **Canola Council risk assessment card**
 - **Rotation, previous disease levels, crop density, past rainfall, forecast, regional risk**
 - **Scout conditions and crop stage**
- **Fungicide application at 20-50% bloom**
- **Sclerotinia tolerant varieties can be used as part of IPM strategy**

Management - soybeans

- **Know your risk**
- **Varietal selection**
 - **Plant stature plays a role**
- **Row spacing**
- **Fungicide applications**
 - **Somewhat inconsistent performance**
 - **Timing: beginning of flowering to beginning of pod development**
 - **Dependent on flower petal coverage (need to penetrate canopy!)**

Role of Rotation in Management

FACT OR FICTION:

Sclerotia (overwintering structures) can survive in the soil for >5 years



Role of Rotation in Management

ANSWER: FACT!

- **Studies have shown differences related to burying depth, environmental conditions (flooding, etc.)**

Role of Rotation in Management

FACT OR FICTION:

Ascospores can travel several miles in the wind

so it doesn't matter what my rotation is if the neighbours are growing susceptible crops





Role of Rotation in Management

ANSWER: Uhh...

- **Difficult to find concrete, consistent evidence relating to “several miles”**
- **Forcible discharge of multiple spores (thousands) allows them to “surf their own wind”**
- **BUT effective transport of ascospores is under 40 metres**

Role of Rotation in Management?

- **Yes**
 - 2017 dry, but...
- **Things to keep in mind:**
 - **Canola is more susceptible to Sclerotinia than soybeans**
 - **Allow yourself flexibility – if it's a bad Sclerotinia year, consider a break from a susceptible host the following year**
 - **Weed control also important, especially in non-host years**
 - **Many alternate hosts for sclerotinia**

Root Rot – multiple organisms

Pathogen	Optimal Environment	Hosts	Overwintering structures
<i>Fusarium</i> spp.	Warm (20-27°C), dry to moist soil	Pulses, cereals, oilseeds	Most - chlamydospores F. graminearum – perithecia on infected stubble
<i>Pythium</i> spp.	Cold (10-15°C), wet soil	Pulses, cereals, oilseeds	Oospores
<i>Rhizoctonia solani</i>	Warm (20-27°C), moist to wet soil	Pulses, cereals, oilseeds	Sclerotia

- These pathogens also part of seedling disease complex

Symptoms - canola



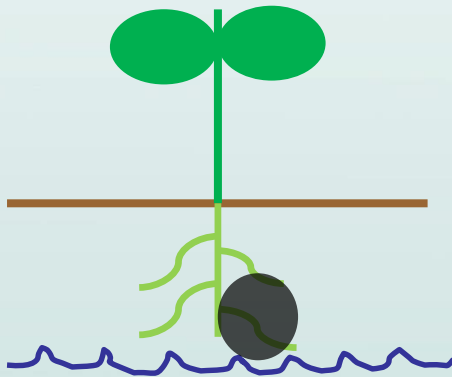
- **Stunted plants, drought symptoms**

Symptoms - soybean

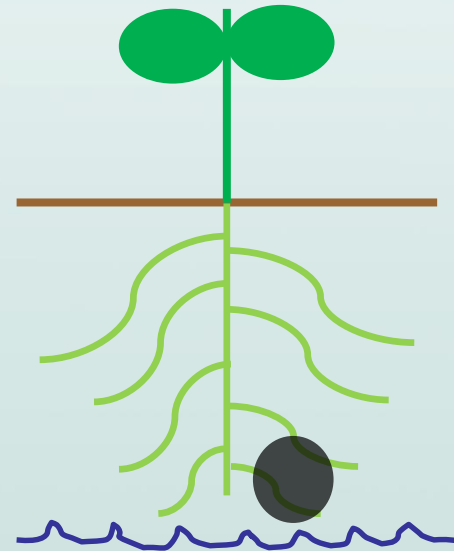


- **Stunted plants, drought symptoms**

Wet spring



“Normal” moisture spring



Management – canola & soybean

- **Plant into well-drained soils, warm soils**
- **Minimize compaction**
- **Plant at appropriate seeding depth**
- **Protect against other disease/insect issues**
- **Fungicidal seed treatments**
 - **Protection during seedling stage**
 - **Important to know what causal agent you've seen in previous years**

Main Problem – Lack of Research

- **In many areas, canola is the new crop**
 - **Not suggested to introduce canola into the rotation the year before soybeans (because of Sclerotinia)**
- **Yield data (MASC)**
 - **No glaring issues with soybean-canola rotation or vice-versa**

NDSU Study

- **Comparing yield of soybean-canola vs wheat-canola and canola-soybean vs wheat-soybean**
- **Looked at different parameters**
 - **Density, height, yield, test weight, oil content**
 - **4 locations, 2 years**

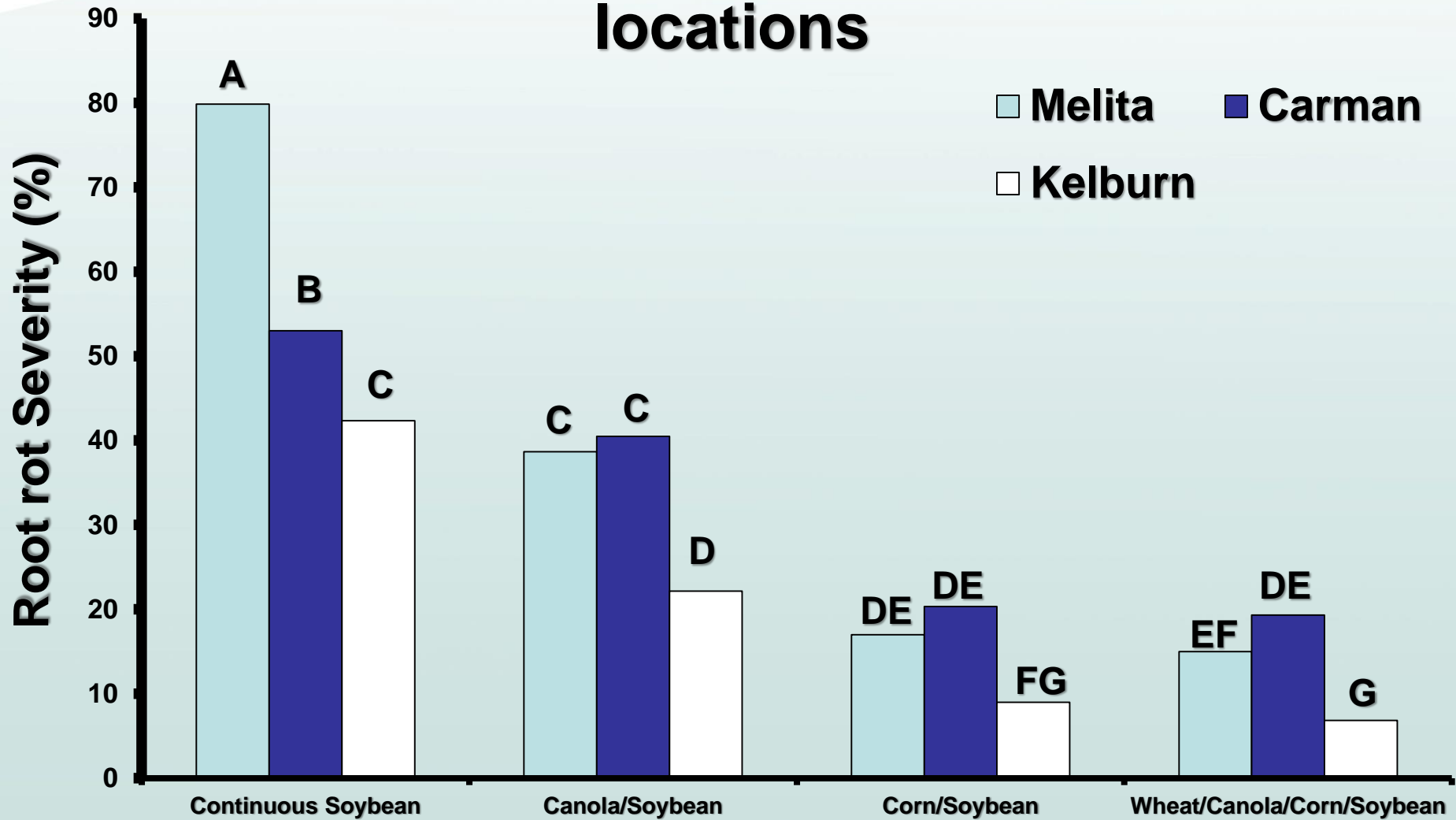
NDSU Study

- **Significant differences were few:**
 - 2015 in Roseau, canola yield higher after soybean (36.3 bu/ac) than after wheat (28.5 bu/ac)
 - 2016 in Roseau, soybean yield higher after canola (55.4 bu/ac) than after wheat (50.6 bu/ac)
 - 2015 in Langdon, soybean test weight slightly higher after wheat (57.3 lb/bu) than after canola (57.0 lb/bu)
 - 2015 in Carrington, soybean height higher after wheat (66.4 cm) than after canola (58.5 cm)
 - 2015 in Minot, canola oil content higher after wheat (40.4%) than after soybean (39.4%)
 - 2015 in Roseau, canola oil content higher after wheat (52.0%) than after soybean (49.0%)

University of Manitoba Study

- **Ahmed Abdelmagid, Postdoctoral Researcher with Dr. Fouad Daayf**
- **Effects of different rotation regimes on soybean disease in three location in Manitoba**
 - **Continous soybean**
 - **Canola/soybean**
 - **Corn/soybean**
 - **Wheat-canola-corn-soybean**

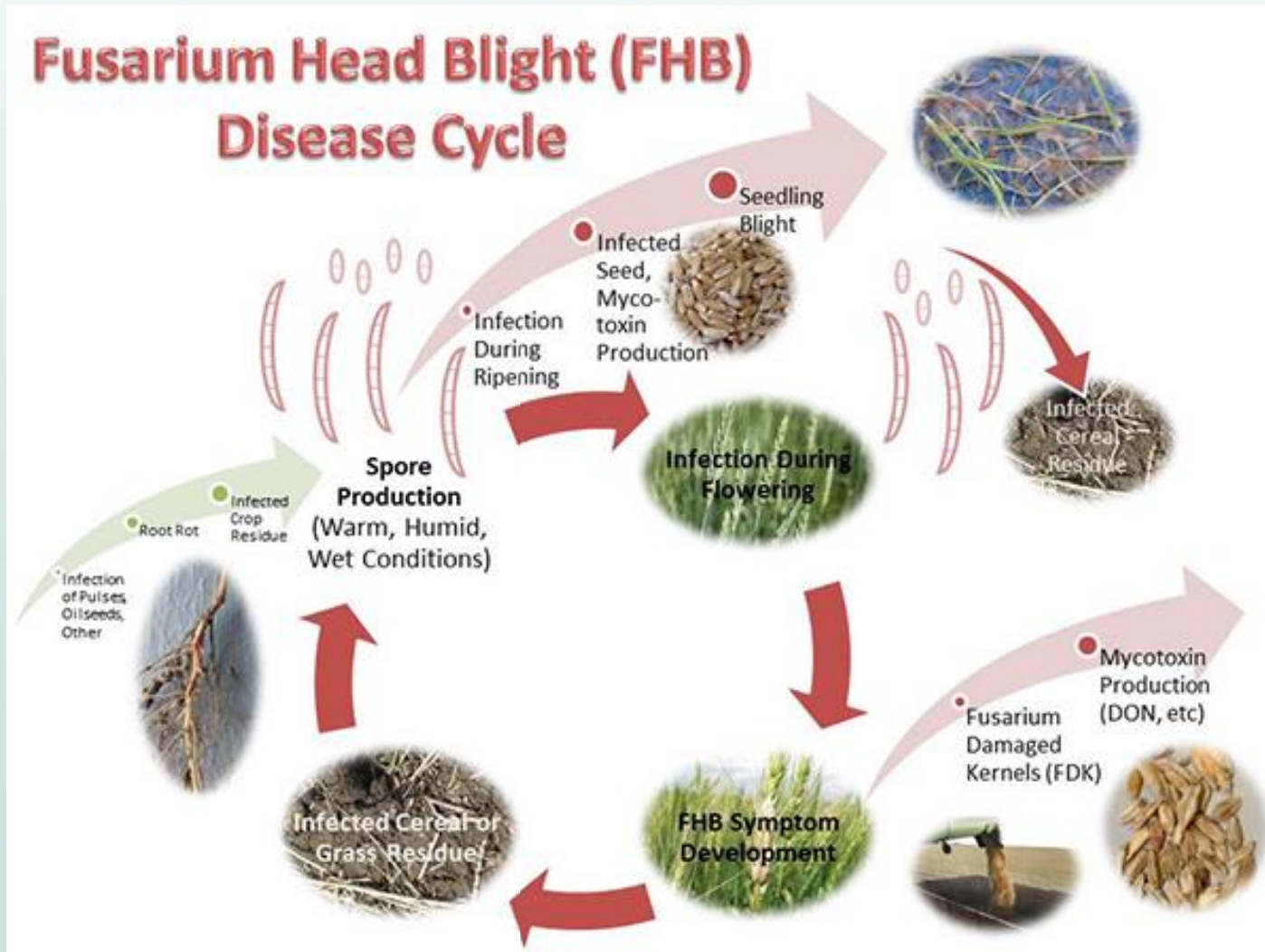
Root rot severity (%) between three locations



But no issues with wheat, right?

- **Well...turns out *F. graminearum* can infect soybean roots**
 - **Not nearly as common as other *Fusarium* species though**

Life cycle - Fusarium



Optimum rotation?

- **Grower-dependent**
 - Weighing risk and rewards
- **Disease is only one part of the complex puzzle**
 - Weeds (resistance, volunteers), fertility, soil health, economics, etc.

2:30 pm – Anastasia Kubinec

“Crop Rotations – Slippery Slope or Economic Opportunity?”

Thank-you!

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