





# Management of Plant Diseases



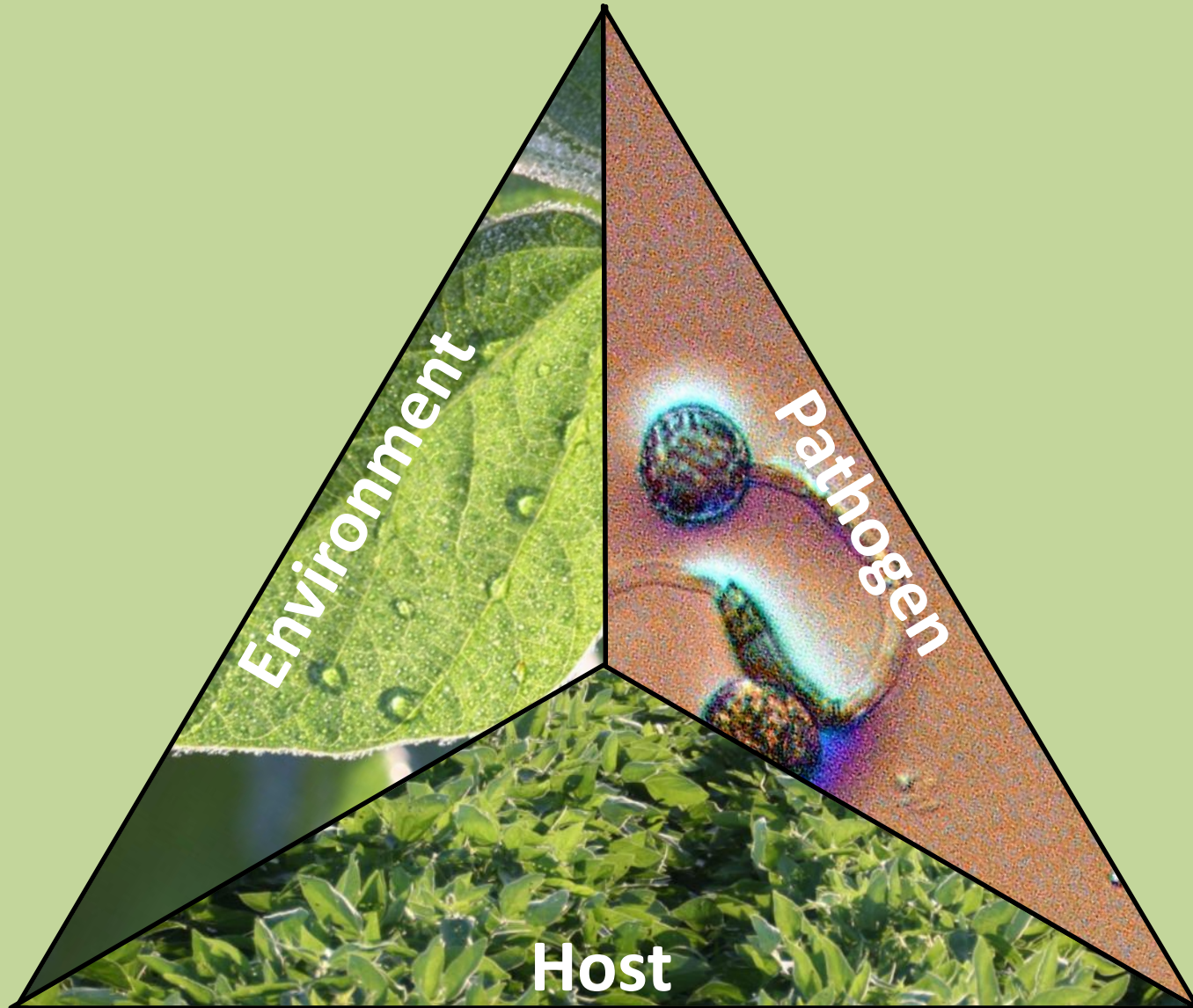
# Outline

---

-  Review the disease triangle
-  The disease cycle
-  Management strategies
-  Interrupting the disease cycle

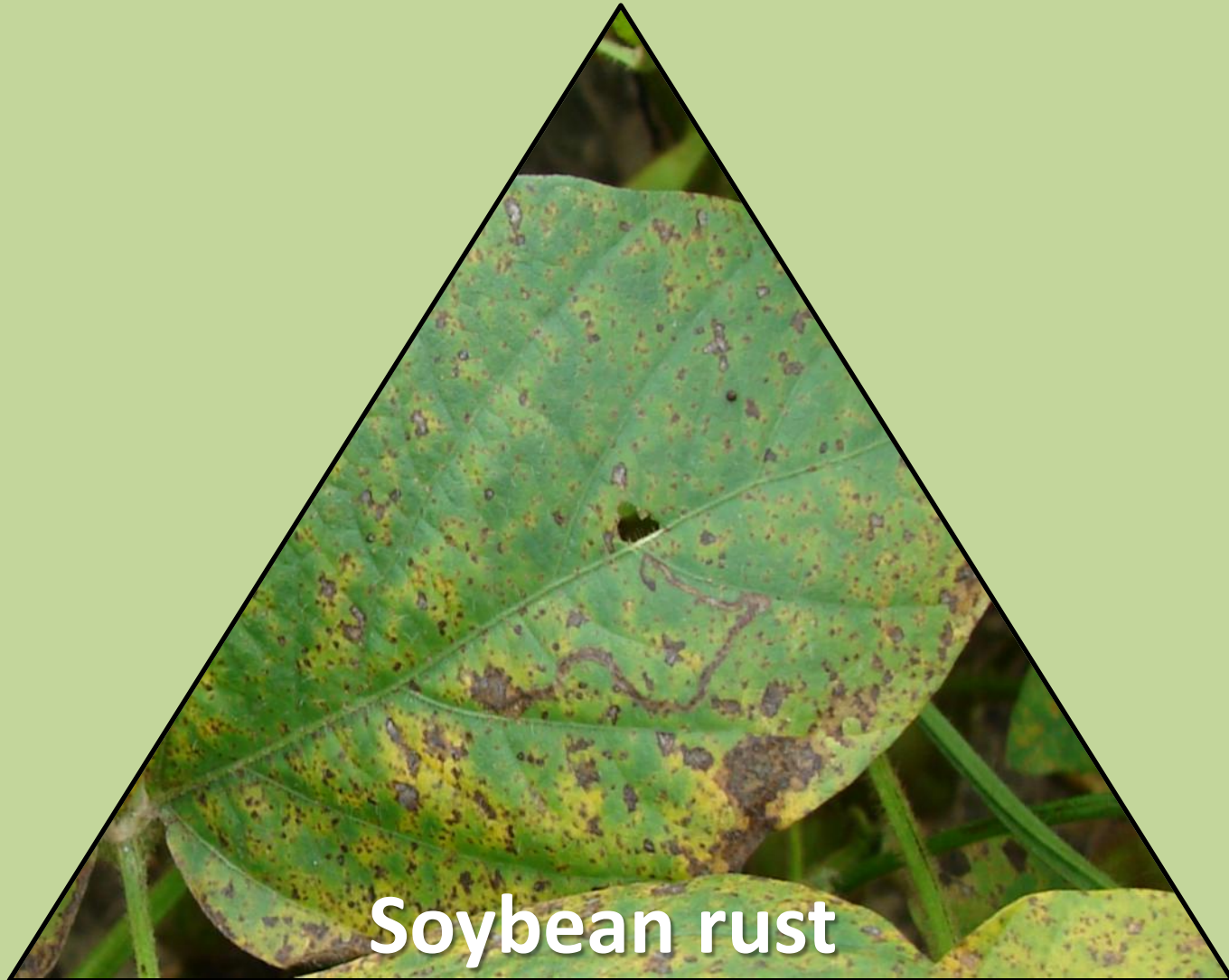
# The Disease Triangle

---



# The Disease Triangle

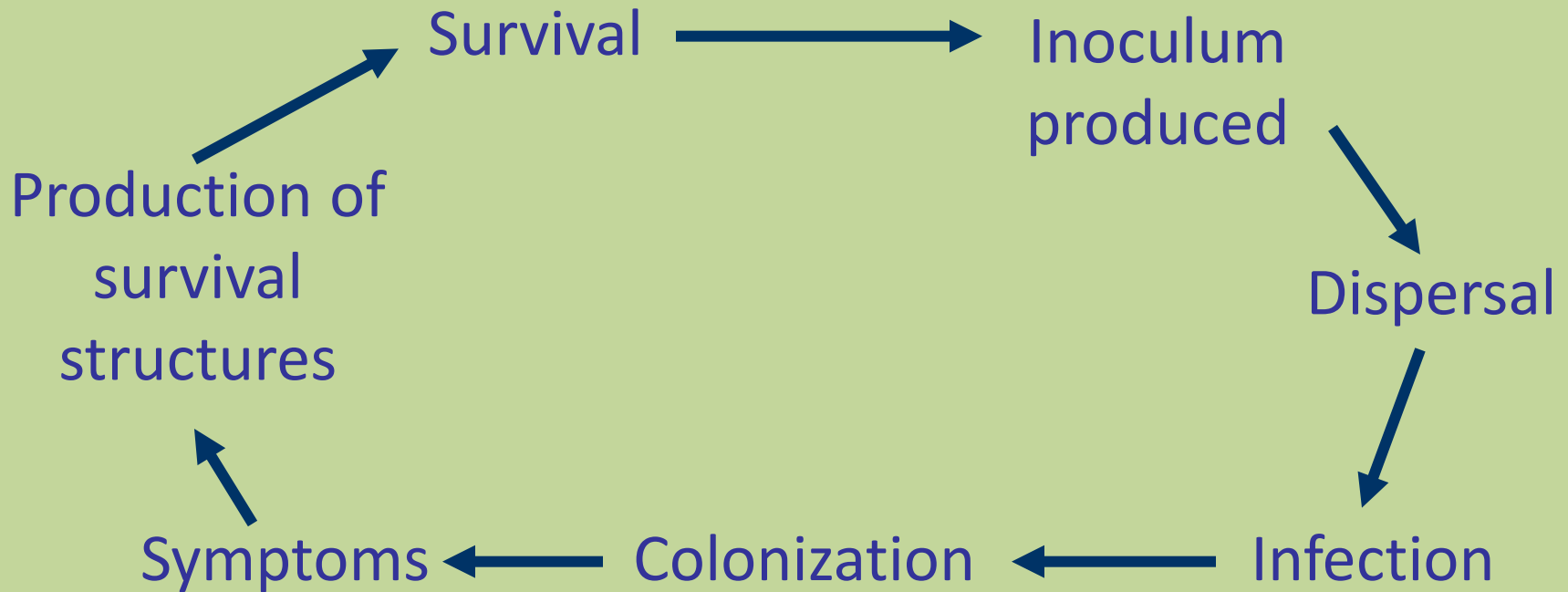
---



Soybean rust

# Disease Cycle

---

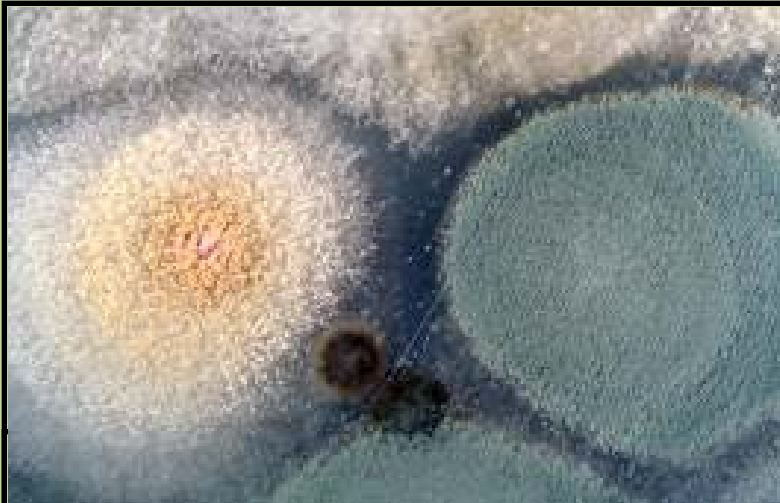


**Management = interrupt the disease cycle**

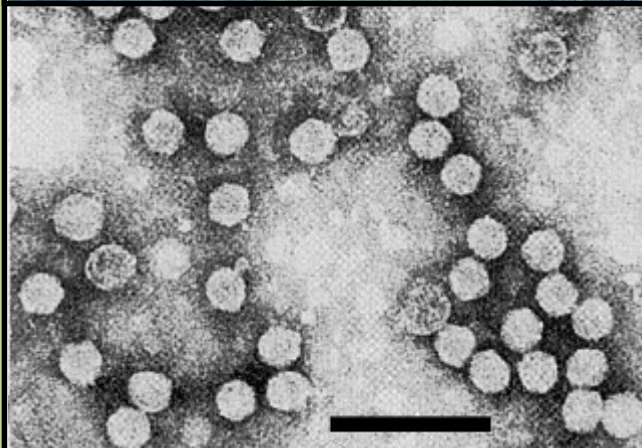
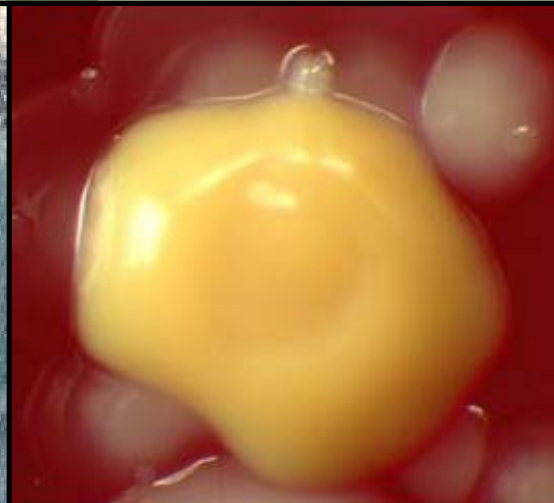
# What causes plant diseases?

---

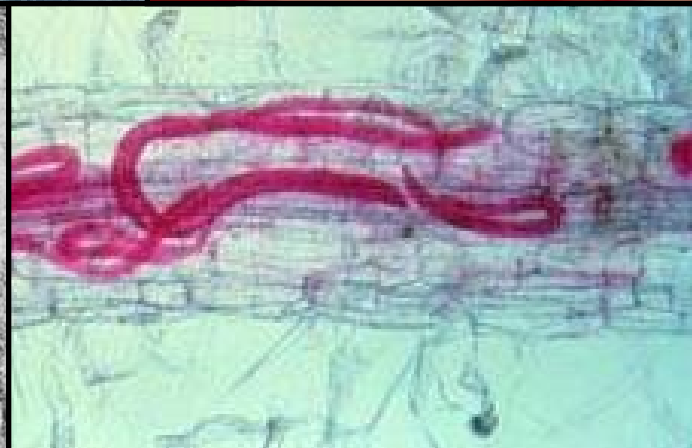
Fungi



Bacteria



Viruses



Nematodes






# Comparison of Disease Cycles

	<b>Fungi</b>	<b>Bacteria</b>	<b>Viruses</b>	<b>Nematodes</b>
Survival	Crop residue	Crop residue	-	Crop residue
	Soil	Soil	-	Soil
	Alt. hosts	Alt. hosts	Alt. hosts	-
	-	Insect vectors	Insect vectors	-
Dispersal	Wind	Wind	-	Tillage
	Rain	Rain	-	Equipment
	Insects	Insects	Insects	Water run-off
Infection	Directly	-	-	Directly
	Wounds	Wounds	-	-
	Insect feeding	Insect feeding	Insect feeding	-

# Management Practices

---

**GOAL: interrupt the disease cycle**

-  Variety selection
-  Manage insects, weeds, and nematodes
-  Cultural practices  
(rotation, tillage, planting date, etc.)
-  Reduce plant stress  
(population, weed management, fertility)
-  Fungicides  
(seed treatments, foliar fungicides)

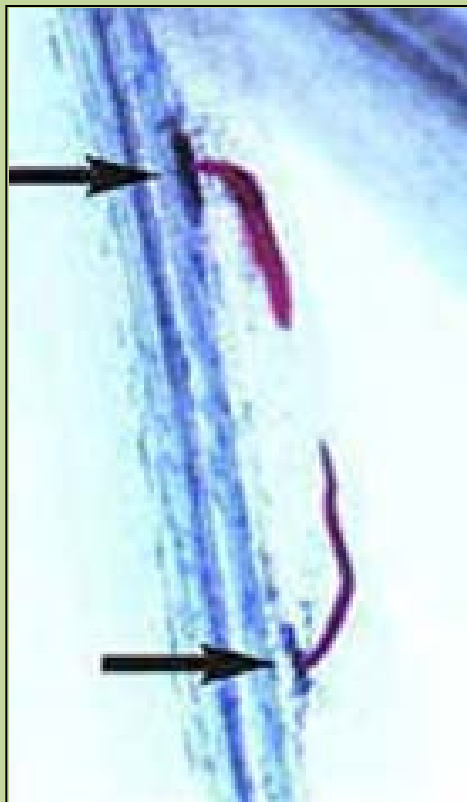


# Management Practices

## 🌽 Variety selection

### 🌾 Resistance

- prevents colonization and disease development



SCN Management Guide, 1999



B. Matthews, ARS

# Management Practices

🌽 Variety selection

🌾 Resistance

- reduces build up of inoculum



Susceptible variety has  
large lesions



Resistant variety has  
smaller and yellowish-  
green color lesions

# Management Practices

---

## 🌽 Variety selection

### 🌱 Seed quality

- plant seed that is high quality



Planting infected seed can inhibit germination, slow seedling growth, or introduce new pathogens into a field.

# Management Practices

---

🌱 Manage weeds, insects, and nematodes

🌿 Weeds

- increase inoculum
- “improve” microclimate for spore production



*Desmodium* species (tick trefoils) are an alternate source of some viruses

# Management Practices

🌱 Manage weeds, insects, and nematodes

🌿 Insects

- source of inoculum
- provide entry wounds for pathogens



# Management Practices

---

🌽 Manage weeds, insects, and nematodes

🌱 Nematodes

- interact with other pathogens



The presence of soybean cyst nematode can increase other soybean diseases like brown stem rot and sudden death syndrome.

# Management Practices

## 🌽 Cultural practices

### 🌱 Crop rotation

- prevents build up of inoculum

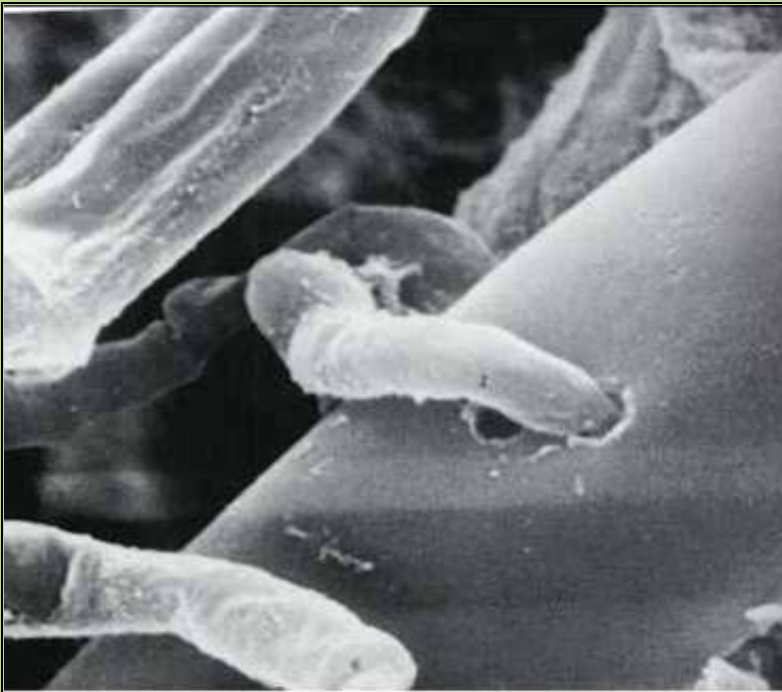


Photo courtesy Dr. Randy Martin, Bioworks, inc.

Destroyed/suppressed



Photo by Brenda Collins, [Http://glaucus.org.uk/Fungi-LC.html](http://glaucus.org.uk/Fungi-LC.html)

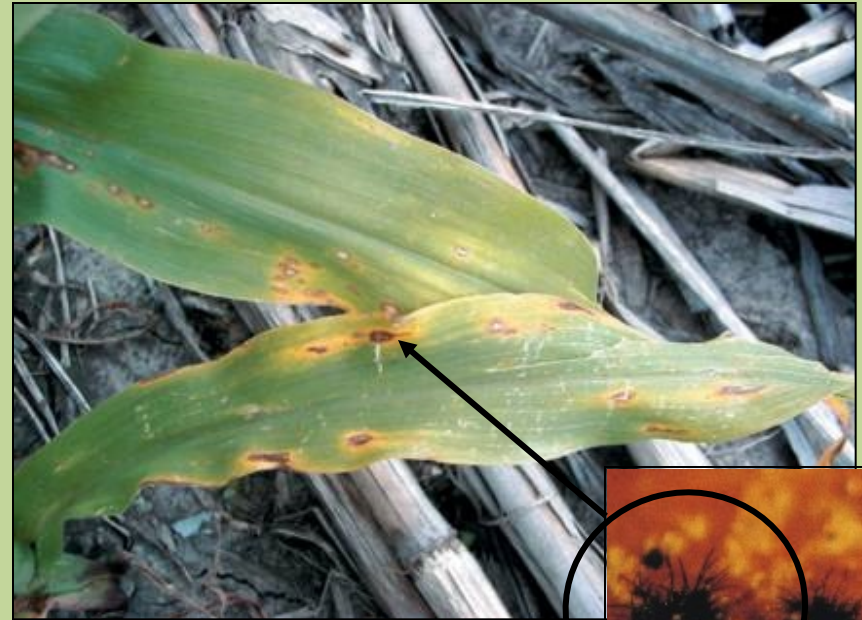
Competition for food

# Management Practices

## Cultural practices

### Tillage

- decreases surface residue (foliar disease inoculum)
- conservation tillage increases soil moisture





# Management Practices

---

## Cultural practices

### Planting date

- escape infection
- escape severe disease

### Harvest date

- remove plants from field before disease becomes problematic

# Management Practices

---

## Reduce plant stress



### High populations

- compete for light, water, and nutrients



### Heavy weed pressure

- competition



### Fertility

- adequate nitrogen and potassium

# Management Practices

---

## Fungicides

### Seed treatments

- protect roots from soilborne pathogens



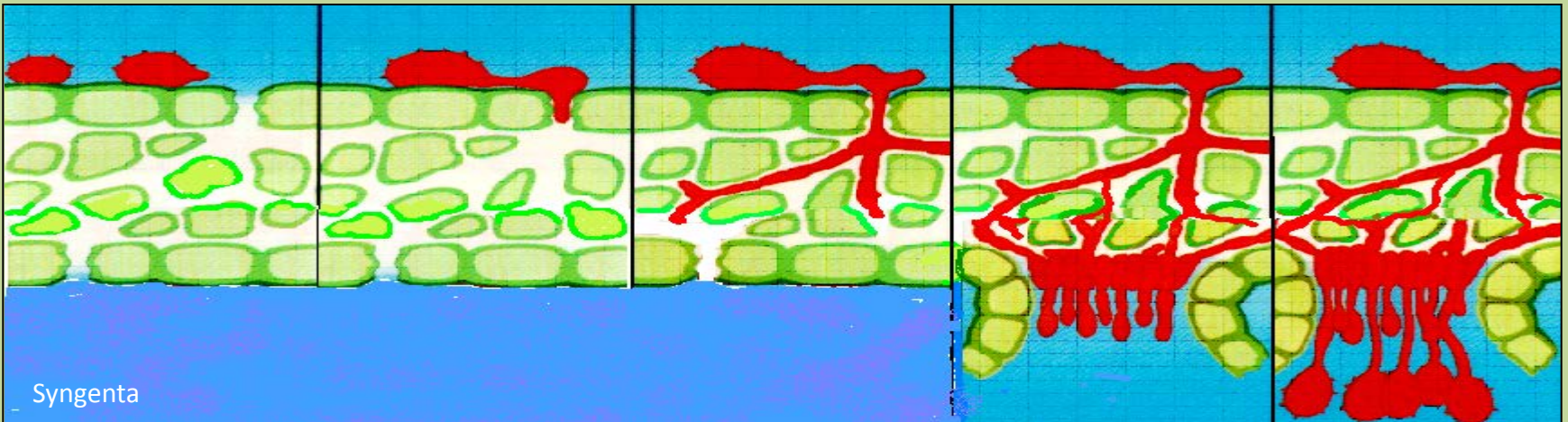
# Management Practices

## Fungicides

### Foliar fungicides

- stop infection and colonization of host

Spore germination    Penetration    Growth    Pustule formation    Sporulation



# Management Practices

---

## Fungicides

### Foliar fungicides

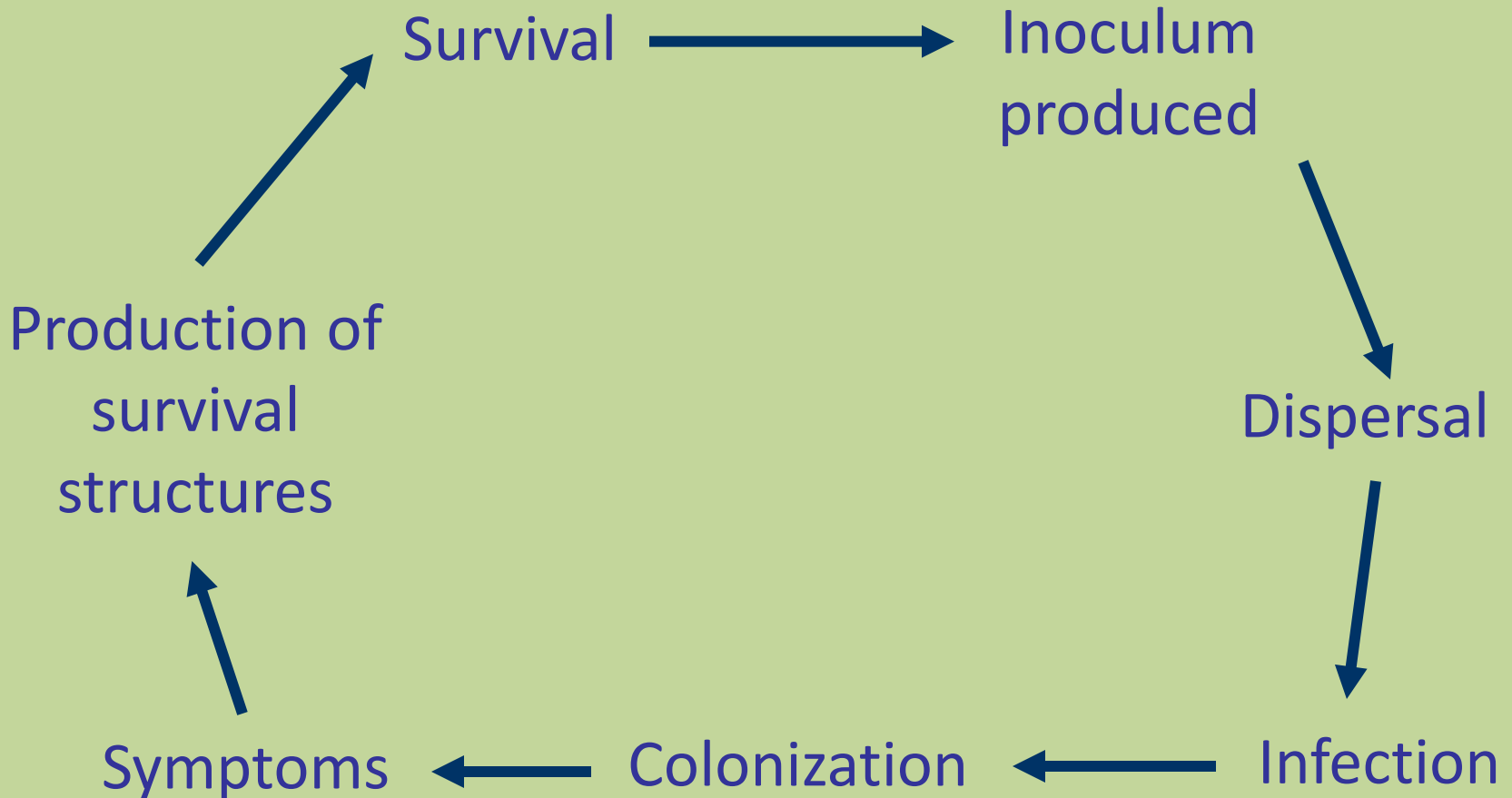
#### CONSIDERATIONS

- Cropping history and percent surface crop residue affect the risk of disease. Many pathogens survive in crop residue, which can be a source of inoculum.
- Varieties vary in their susceptibility to diseases.
- Disease presence early in the season may result in greater yield loss than diseases that occur later in the season.
- Fungicides do not affect diseases caused by bacteria, viruses, or nematodes.
- Profitability of a fungicide application depends on the price of grain and the cost of application.

# Interrupting the disease cycle

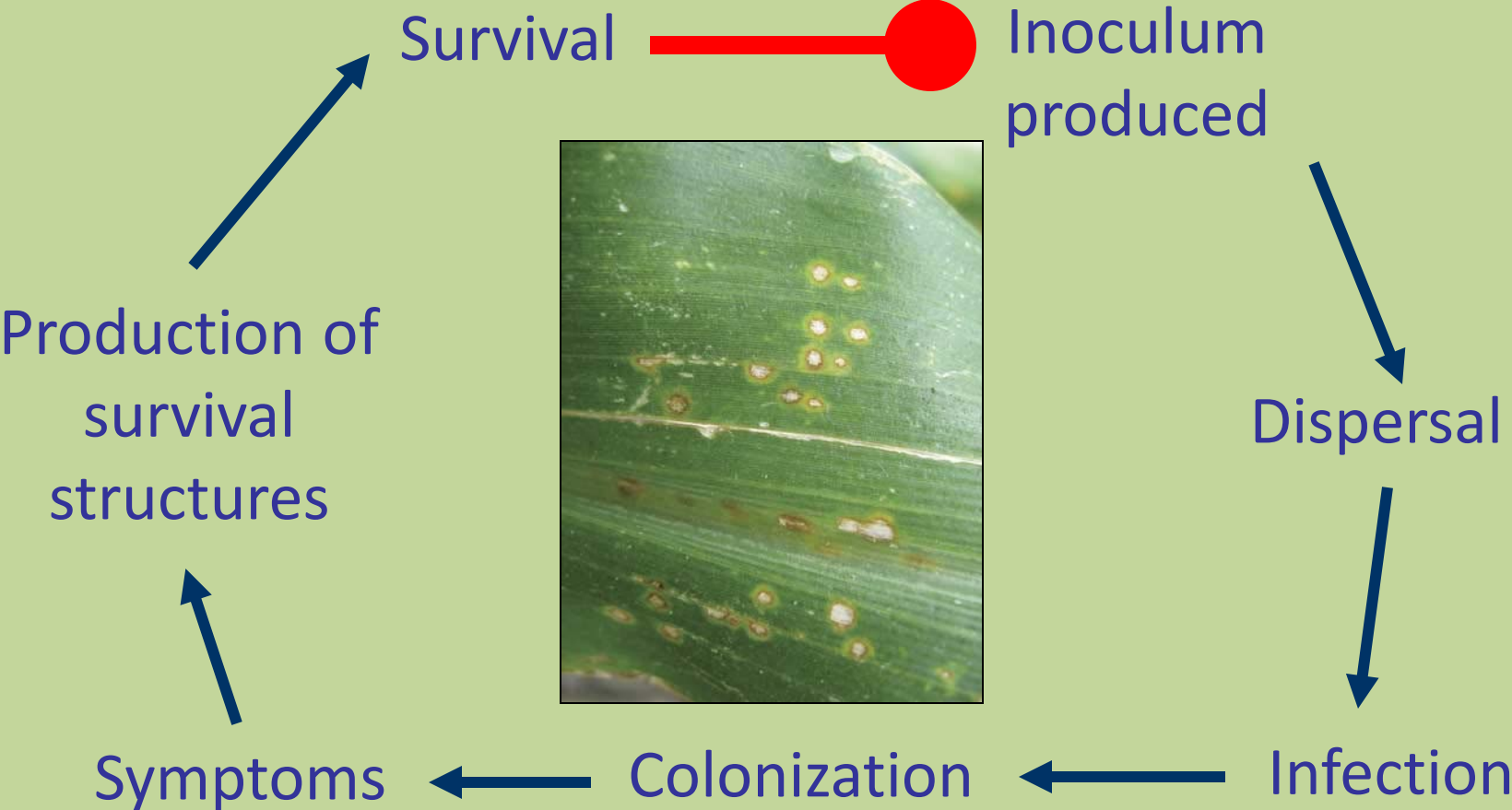
---

How does management interrupt the disease cycle?



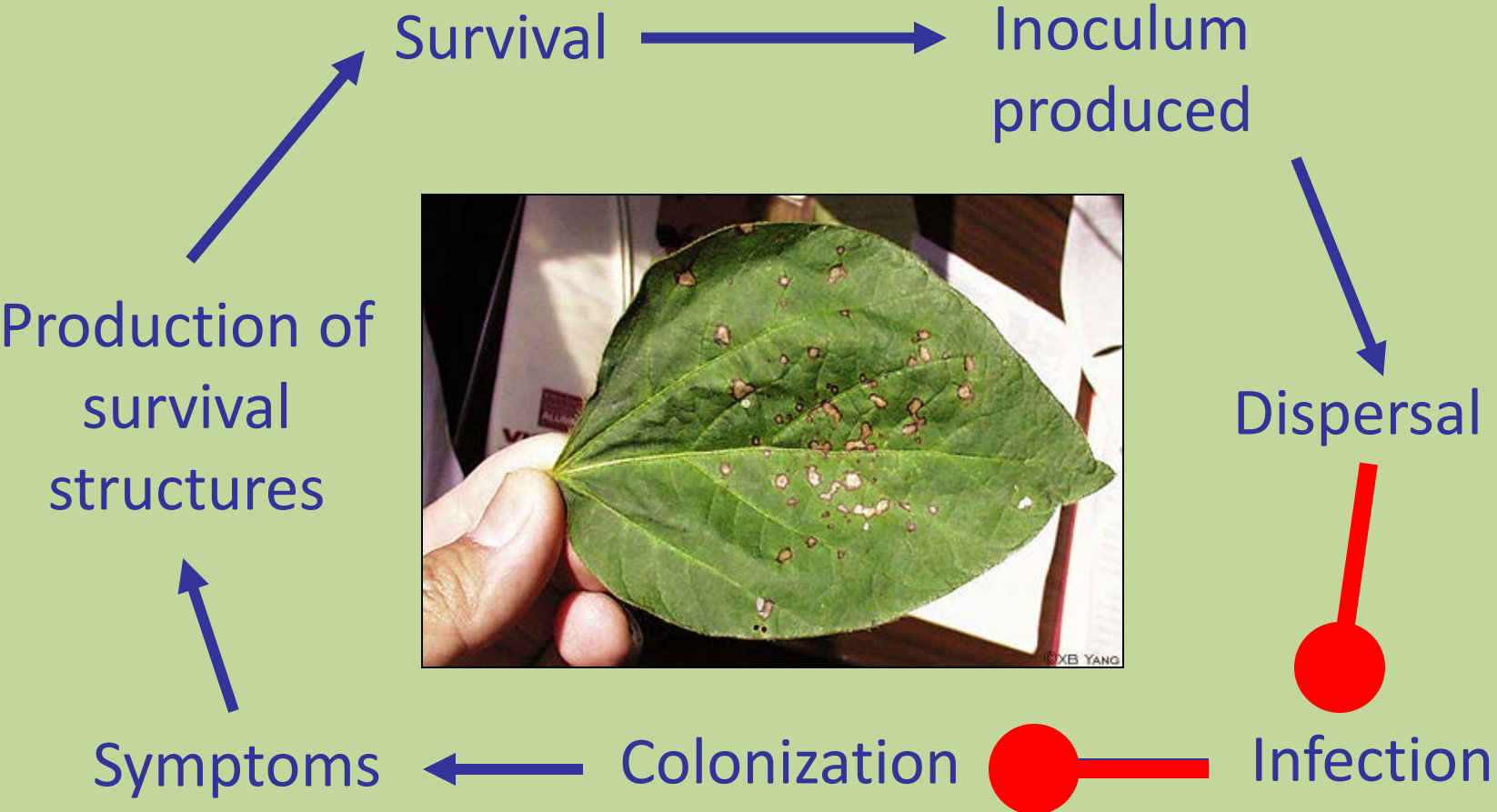
# Interrupting the disease cycle

Rotation; tillage; planting high quality seed



# Interrupting the disease cycle

## Variety resistance; fungicides





# Summary

---



The disease cycle for all pathogens is essentially the same.



Effective management strategies break the disease cycle.



An understanding of the disease cycle will help implement management strategies.