



# Diseases of Tomato

---

Presented By:- Devendra  
Choudhary

# Contents

1. Damping  
off

2. Wilt

3. Early  
blight

4. Late  
blight

5. Buck eye  
rot

6. Leaf curl

7. Mosaic

# Damping off



# Causal organism

- *Pythium aphanidermatum*

Devendra

# Symptom

- Damping off of tomato occurs in two stages, i.e. the **pre-emergence** and the **postemergence phase**.
- In the pre-emergence the phase the seedlings are killed just before they reach the soil surface.
- The young radical and the plumule are killed and there is complete rotting of the seedlings.
- The post-emergence phase is characterized by the infection of the young, tissues of the collar at the ground level.
- The infected tissues become soft and water soaked.
- The seedlings topple over or collapse.



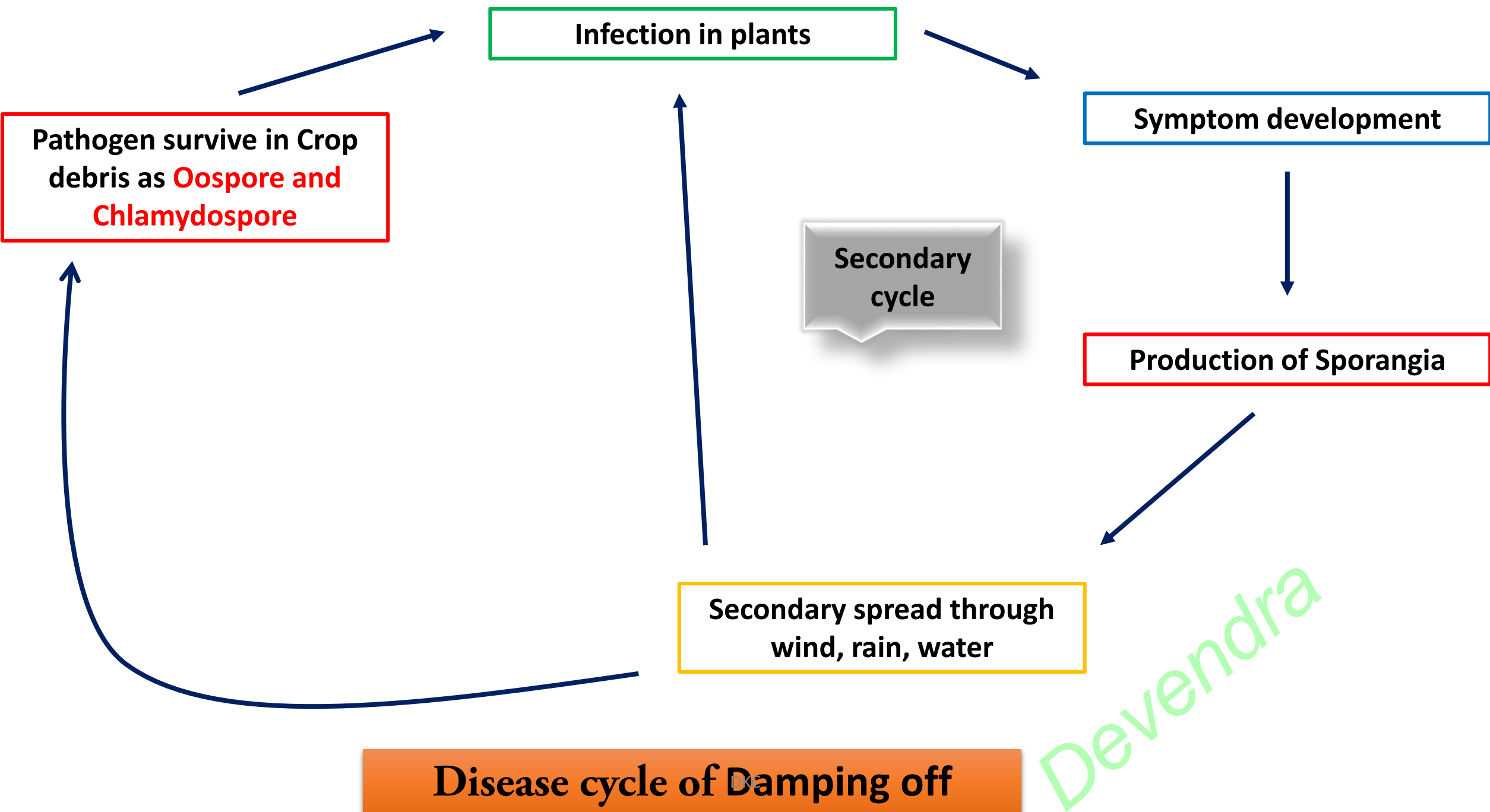
Devendra

# Etiology

- **Mycelium** – branched, hyaline, Aseptate or Coenocytic
- **Sporangiophore** – simple like mycelium, bear single sporangia
- **Sporangia** – globose without papillae
- **Oospore** – spherical, double thick walled



# Disease cycle



# Epidemiology

- $T = 20-22^{\circ}\text{C}$
- $>90\%$  RH
- Cloudy days
- Intermittent rains
- Dense cropping
- Poor drainage of soil

# Management

- Used raised seed bed.
- Provide light, but frequent irrigation for better drainage.
- Drench with Copper oxychloride 0.2% or Bordeaux mixture 1%.
- Seed treatment with fungal culture *Trichoderma viride* (4 g/kg of seed) or Thiram (3 g/kg of seed)
- Spray 0.2% Metalaxyl when there is cloudy weather
- Sanitation
- Crop rotation

**Wilt**



# Causal organism

- Fungus wilt - *Fusarium oxysporum f. sp. lycopersici*
- Bacterial wilt – *Ralstonia solanacearum*

# Symptom - Fungus

- Clearing of the veinlets and chlorosis of the lower leaves
- The symptoms continue in subsequent leaves.
- Soon the petiole and the leaves droop and wilt.
- The younger leaves may die in succession and the entire plants may wilt and die in a course of few days.
- At later stage, browning of vascular system occurs.
- Diseased plants appear in patches

# Symptom - Bacteria

- Characteristic symptoms of bacterial wilt are the rapid and complete wilting of normal grown up plants.
- Lower leaves may drop before yellowing.
- Pathogen is mostly confined to vascular region; in advantage cases, it may invade the cortex and pith and cause yellow brown discoloration of tissues.
- Infected plant parts when cut and immersed in clear water, a white streak of bacterial ooze is seen coming out from cut ends.

HGIC, U of MD



Susceptible

Resistant

DKC

Devendra

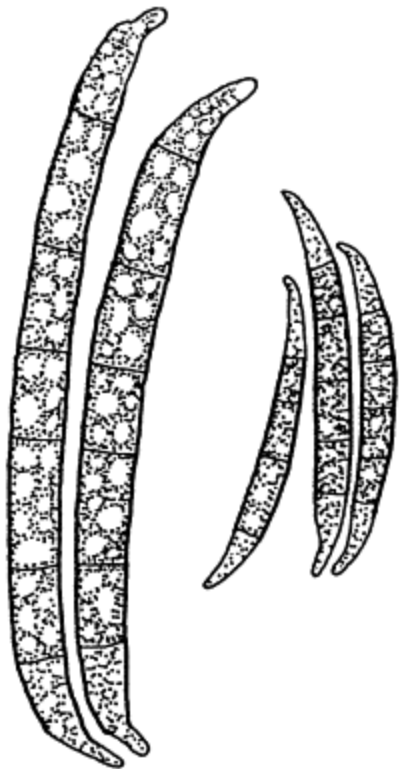


DKC

Devendra

# Etiology

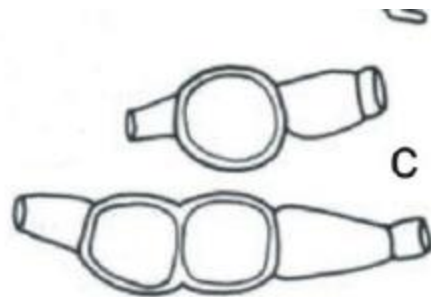
- Mycelium – Septate, branched, light pink
- Conidia – 1. macro conidia – boat shaped, hyaline, long, septate, pointed at tip
- 2. micro conidia – small, curved, unicellular
- Conidiophore – simple, slender, short, produced in sporodochium
- Chlamydospore – spherical , thick walled



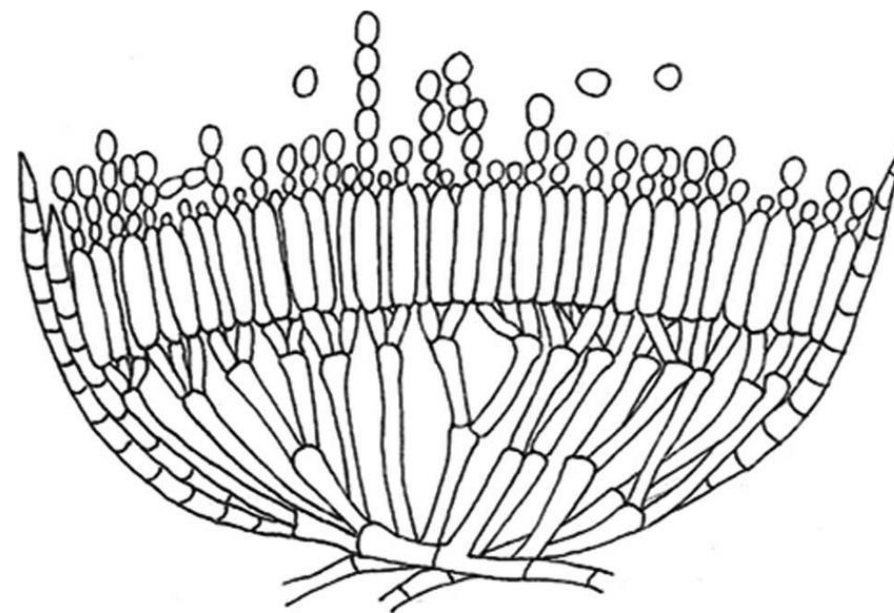
Macro conidia



Micro conidia



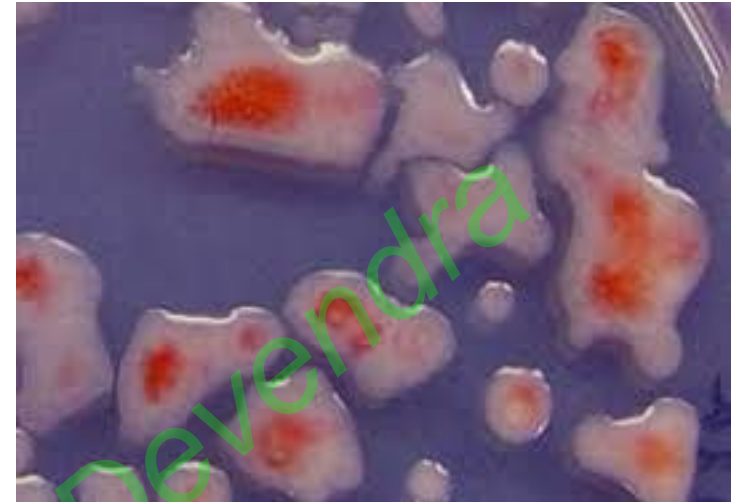
Chlamydospore



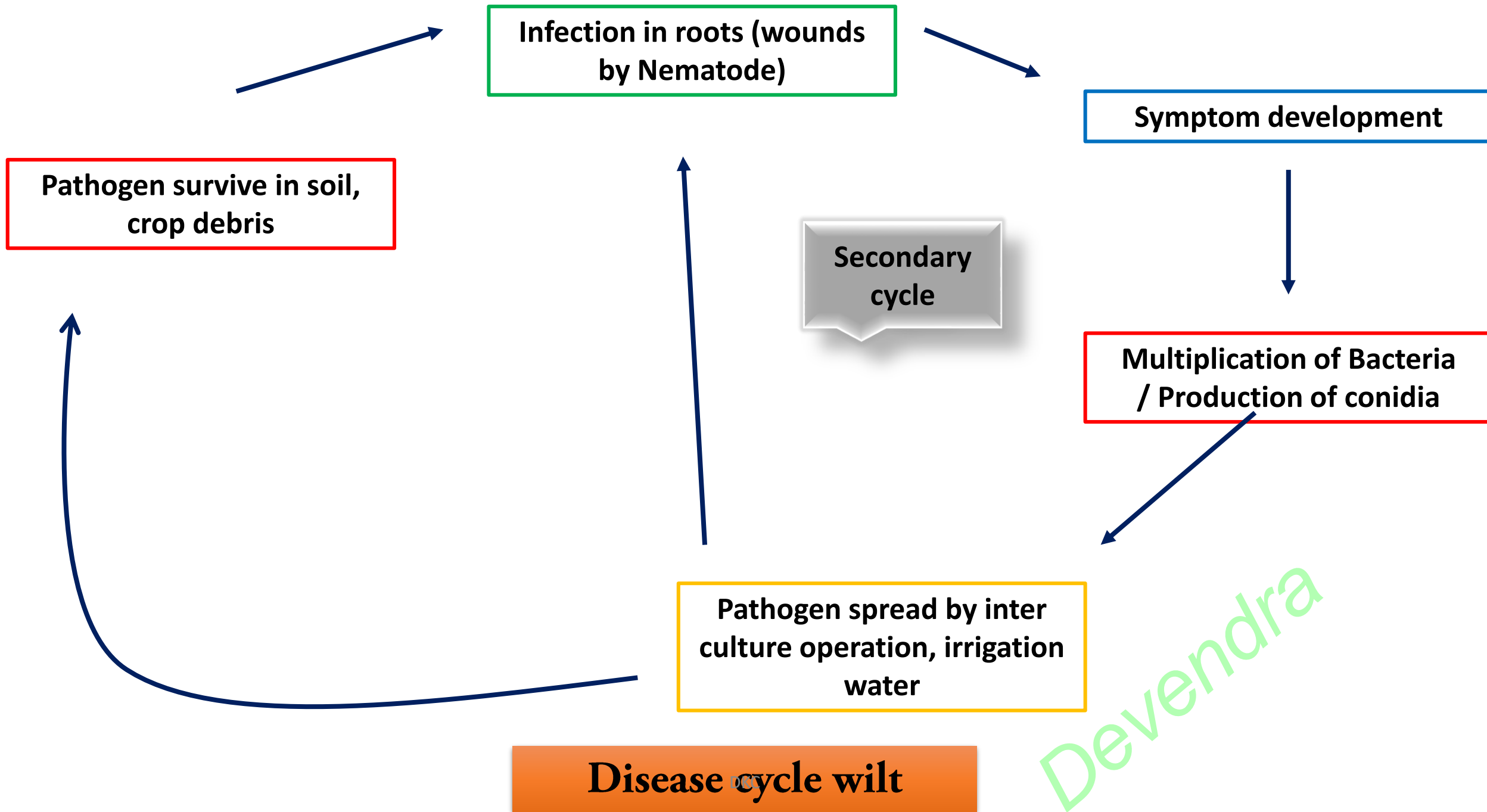
Sporodochium

# Etiology

- Gram stain – Negative
- Cell shape – Rod
- Flagella – Monotrichous
- Colony – Mucoid, pink center in CPG-TTC media



# Disease cycle



# Epidemiology

- Saturated poorly drained soils
- Warm and moist weather
- Cultivation of susceptible cultivars
- High N<sub>2</sub>

# Management

- Sanitation
- Removal of crop debris
- Nematode management
- Healthy rhizome
- Rotation with non-solanaceous crops
- Sterilization of farm implements
- Application of *Pseudomonas*



# Early blight

# Causal organism

- ***Alternaria solani***

Devendra

# Symptom

- This is a common disease of tomato occurring on the foliage at any stage of the growth.
- Early blight is first observed on the plants as small, black lesions mostly on the older foliage.
- Spots enlarge up to one-fourth inch in diameter or larger
- concentric rings in a **bull's eye pattern** developed in the center of the diseased area.
- Seedling infection cause collar rot

# Symptom

- Tissue surrounding the spots may turn yellow.
- If high temperature and humidity occur at this time, much of the foliage is killed.
- Lesions on the **stems** are similar to those on leaves, sometimes girdling the plant if they occur near the soil line.
- The fungus also infects the fruit, generally through the calyx or stem attachment.
- Lesions attain considerable size, usually involving nearly the entire fruit; concentric rings are also present on the fruit.



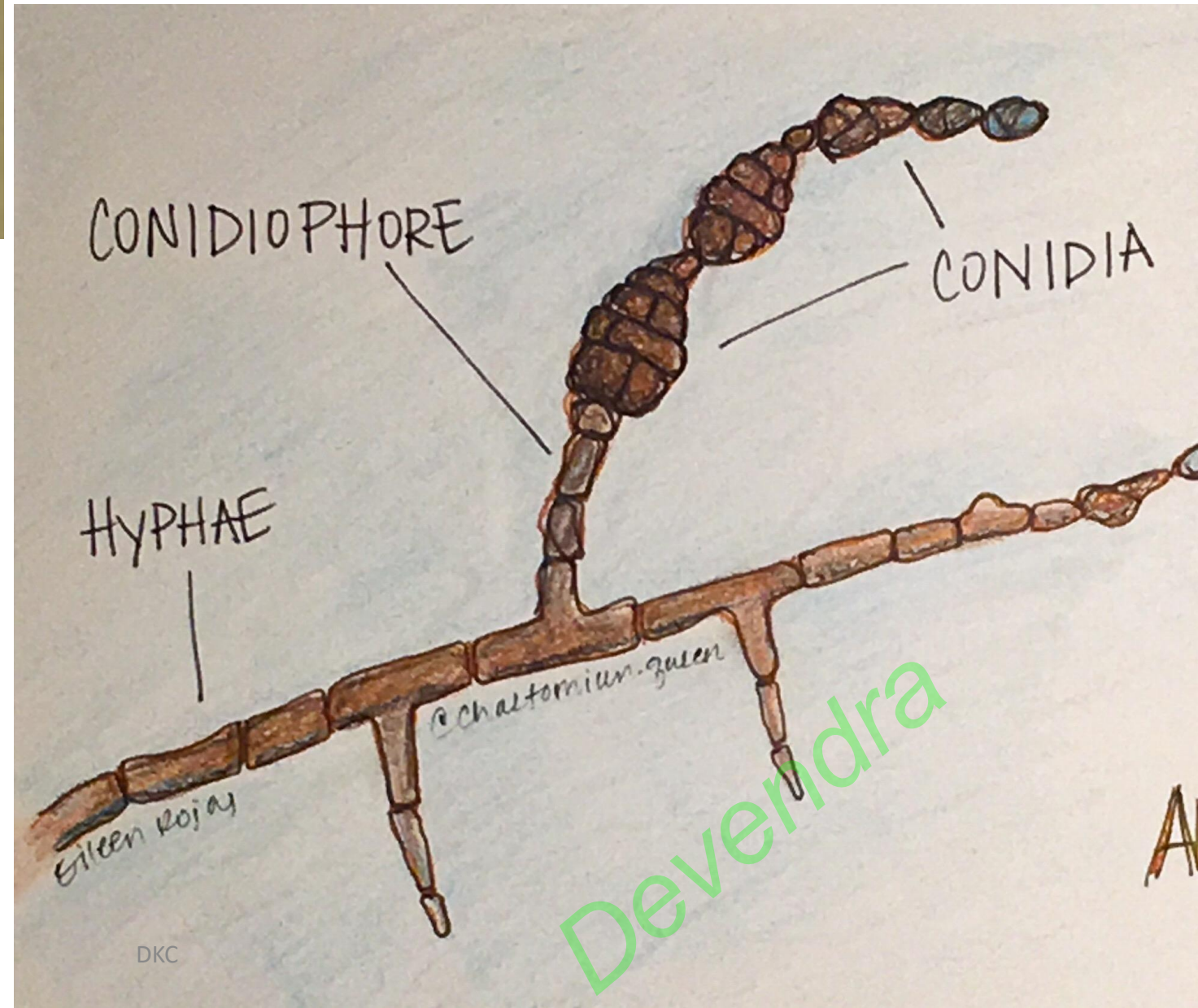
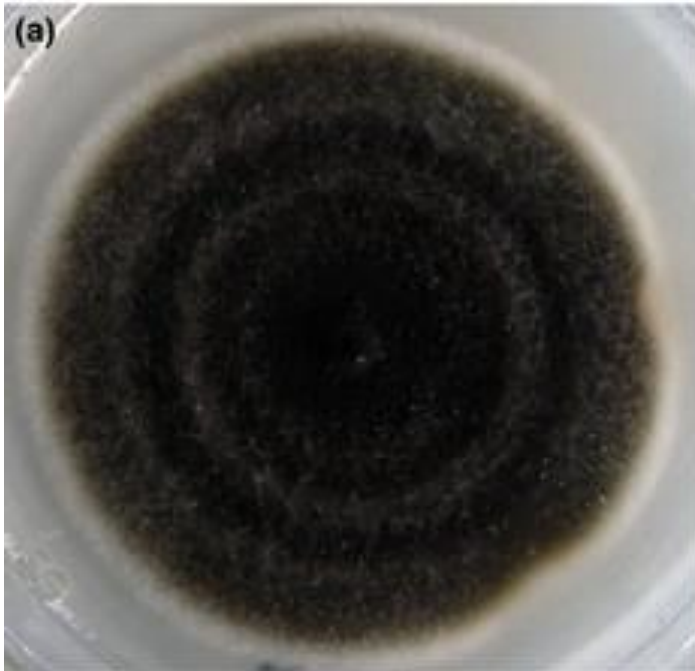
DKC



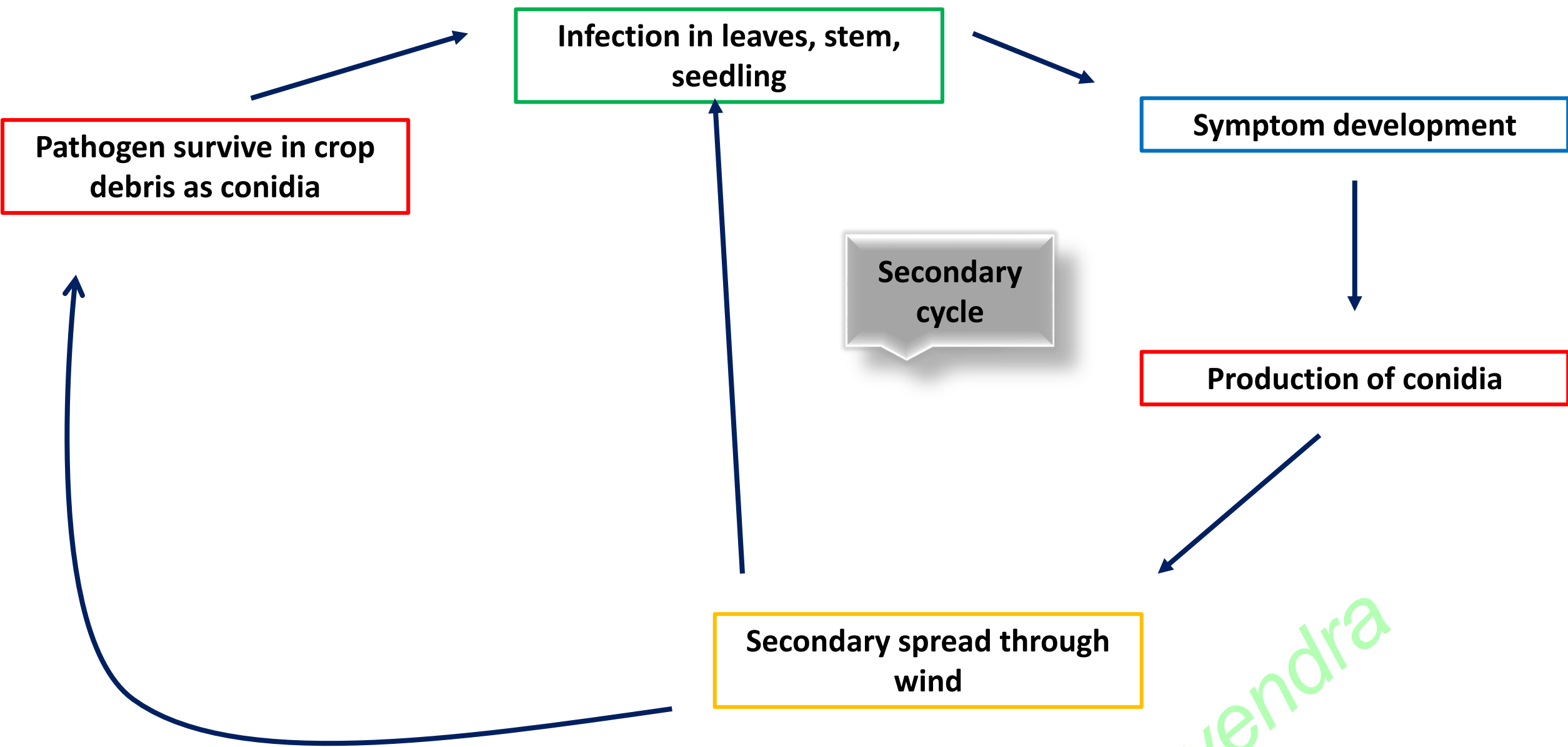
Devendra

# Etiology

- Mycelium – Septate, Branched and Dark
- Conidia – muriform (longitudinal and transverse septation), dark, formed in chain
- Conidiophore – short, dark colored, simple, septate
- Perfect stage - Pleospora



# Disease cycle



**Disease cycle of Early leaf spot**

Devendra

# Epidemiology

- $T = 24-30$
- $RH = >90\%$
- Cloudy days

# Management

- Crop rotation with non host
- Sanitation
- Removal and burning of infected crop debris and weed host
- Application of organic manure
- Spray Mancozeb 2 kg/ha in 15 days interval.



# Late blight

---



# Causal organism

- ***Phytophthora infestans***

Devendra

# Symptom

- Water soaked lesions appears on edge of leaves
- Later it turns to large, brown patches with a green gray edge; not confined by major leaf veins.
- Infections progress through leaflets and petioles, resulting in large sections of brown foliage.

# Symptom

- Lesions also girdle the Stem
- Dark brown, circular spots cover large parts of fruits, leading to dry brown rot
- In high humidity, thin powdery white fungal growth appears on infected leaves, fruit and stems.
- In cool, wet weather, entire fields turn brown and wilted



DKC

Devendra

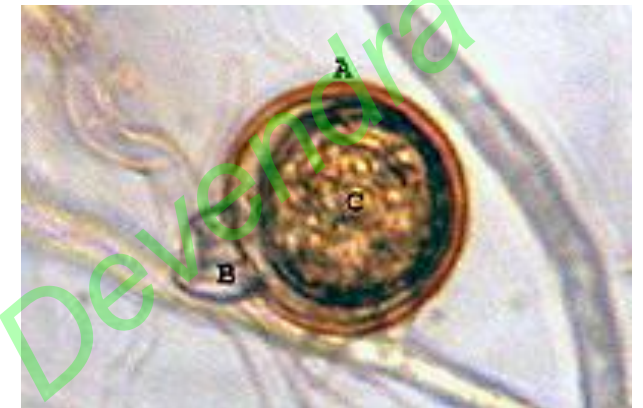
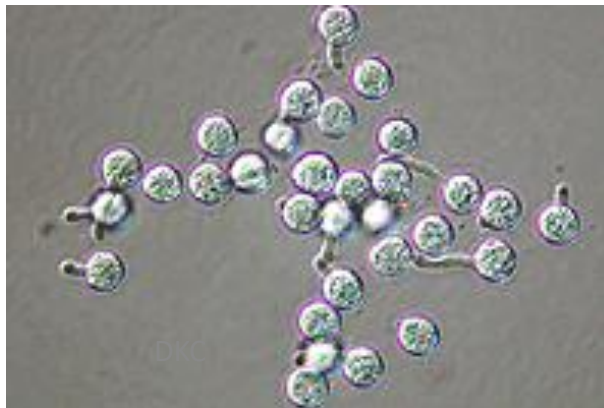
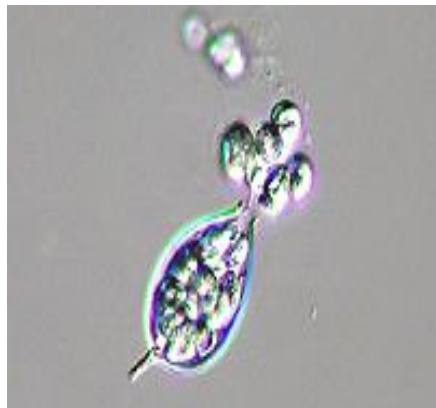
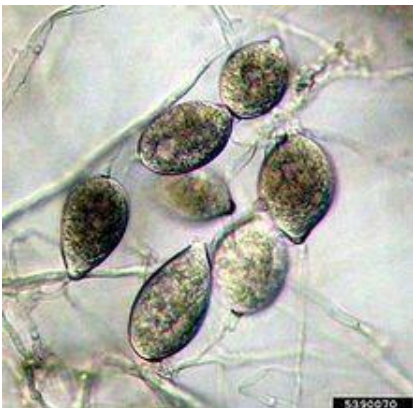


DKC

Devendra

# Etiology

- The pathogen produces non-septate and hyaline mycelium.
- Sporangiophores emerge through the stomata on the lower surface singly or in groups.
- They are unbranched and bear single celled, hyaline, round or oval sporangia at the tip singly.
- The sporangia germinate to produce abundant zoospores.
- The fungus also produces oospores and chlamydospores in adverse seasons.



# Disease cycle

# Disease cycle of Phytophthora blight

Infection through Stomata

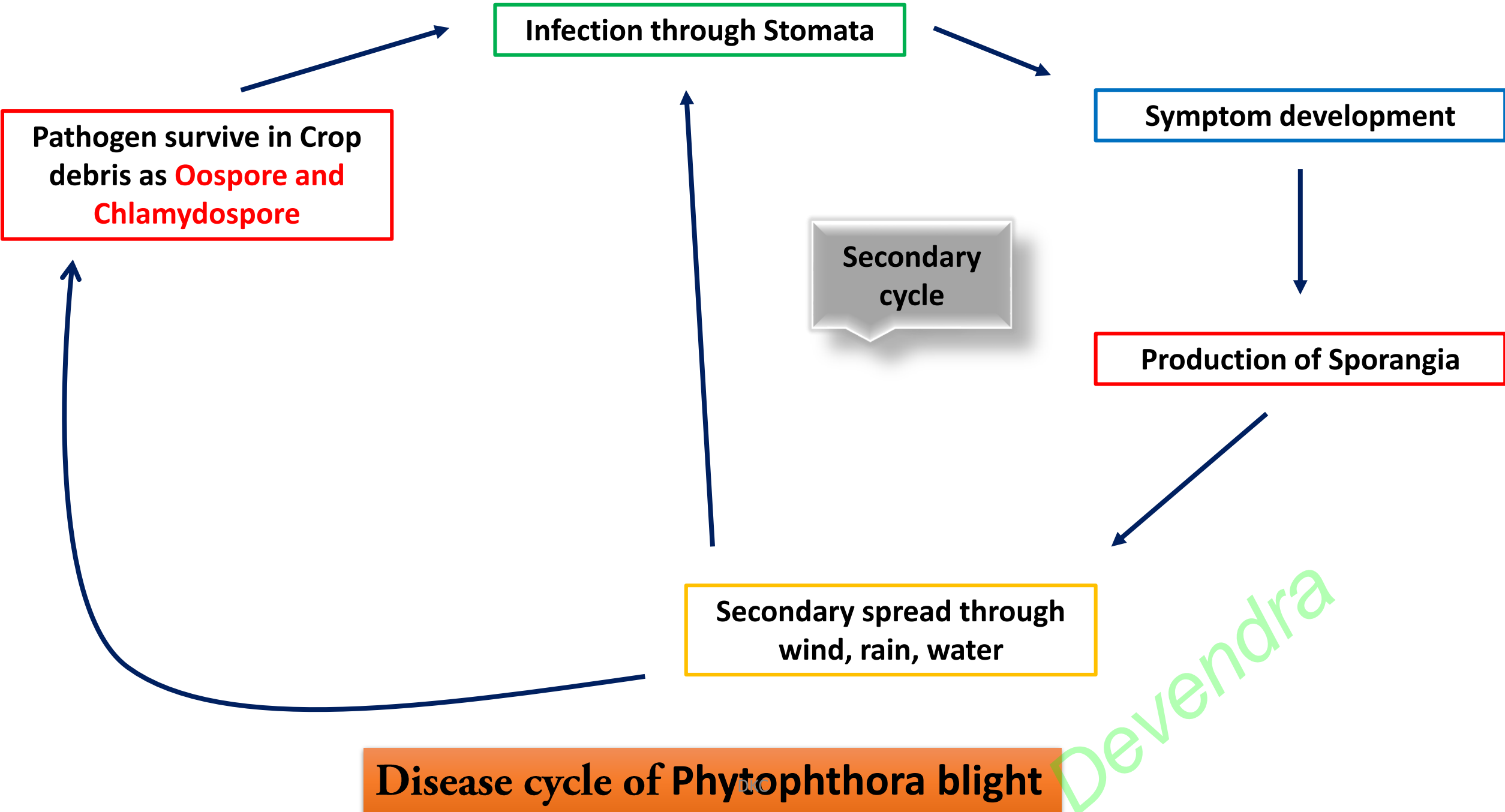
Symptom development

Production of Sporangia

Secondary cycle

Secondary spread through wind, rain, water

Pathogen survive in Crop debris as **Oospore and Chlamydospore**



# Epidemiology

- $T = 20-22^{\circ}\text{C}$
- $>90\%$  RH
- Cloudy days
- Intermittent rains
- Dense cropping
- Poor drainage of soil

# Management

- Crop rotation
- Deep summer ploughing
- Removal of infected crop debris
- Proper drainage
- Selection of healthy seeds
- Resistant cultivars – Ottawa-31, Ottawa-30
- Seed treatment with mancozeb
- Foliar application of Ridomil (0.1%)
- Soil application of Trichoderma bioformulation @ 25kg/ha



# Buck eye rot

---



# Causal organism

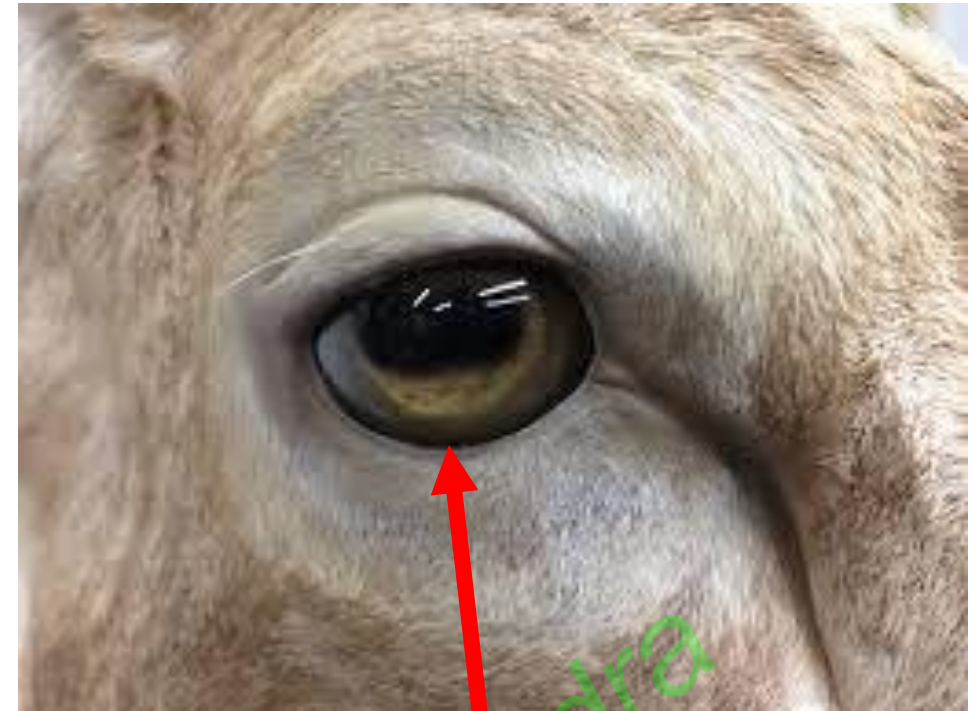
- **Buckeye rot of tomato** is caused by three species of pathogen *Phytophthora*:
- *P. nicotianae* var. *parasitica*,
- *P. capsici*, and
- *P. drechsleri*

# Symptom

- brown and greyish-green water-soaked spots appear on the fruit.
- These spots develop into lesions that resemble the markings of a bull's eye with alternating dark and light brown concentric rings.
- These are very smooth lesions, barely raised, unlike the rough lesions found in late blight (*Phytophthora infestans*)

# Symptom

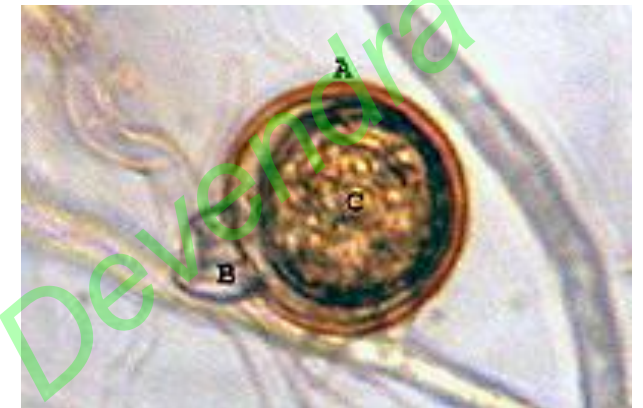
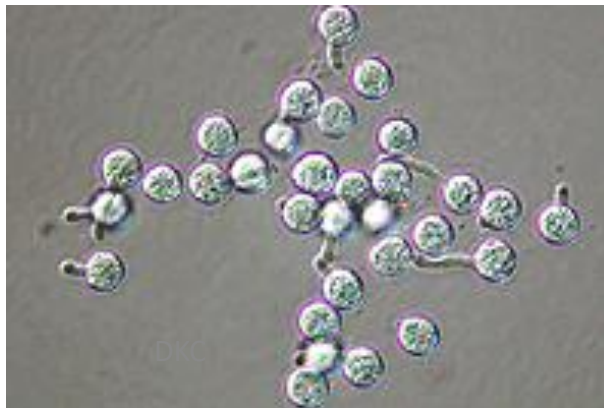
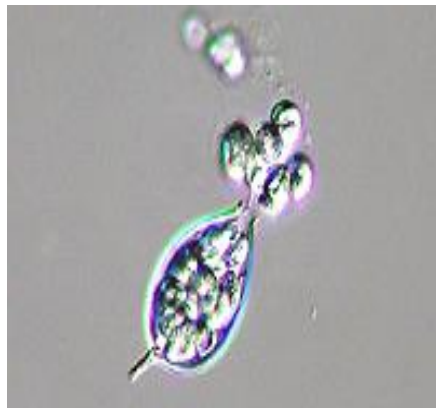
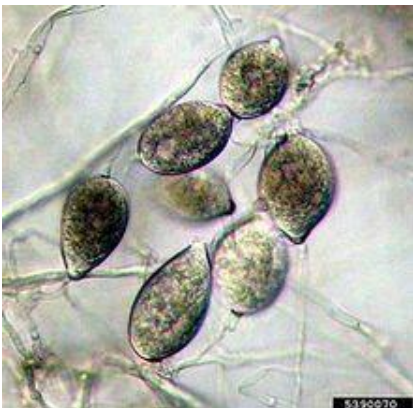
- Buckeye rot lesions may cover half or more of the fruit and the margins of lesions will be smooth but not sharply defined
- Finally, a white fungal-like growth may appear within the lesion.
- While fruit rot is the most common symptom, damping off and stem cankers are possible.
- The disease does not affect the foliage of the plant, which further helps separate it from late blight



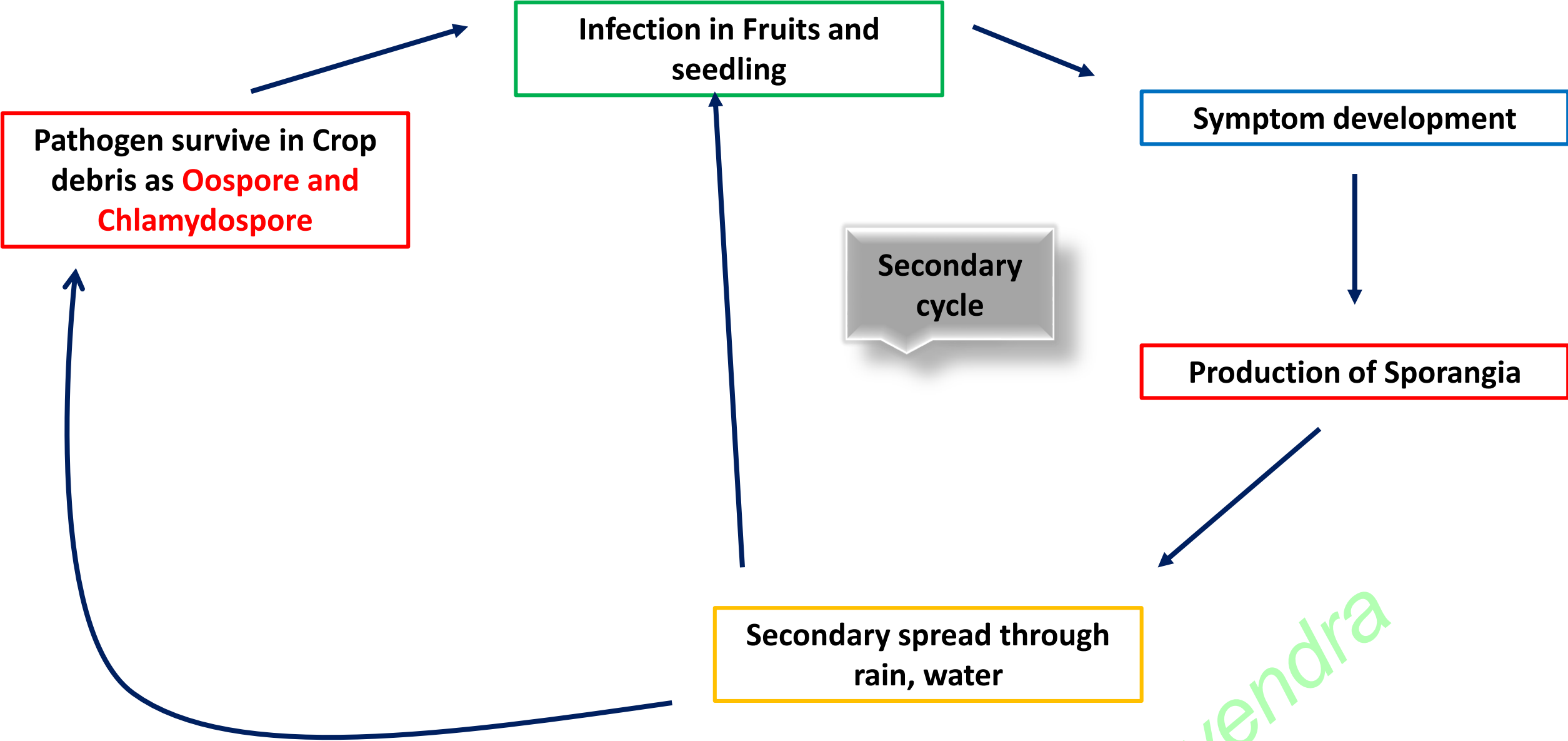
**Buckeye**

# Etiology

- The pathogen produces non-septate and hyaline mycelium.
- Sporangiophores emerge through the stomata on the lower surface singly or in groups.
- They are unbranched and bear single celled, hyaline, round or oval sporangia at the tip singly.
- The sporangia germinate to produce abundant zoospores.
- The fungus also produces oospores and chlamydospores in adverse seasons.



# Disease cycle



**Disease cycle of Buck eye rot**

Devendra

# Epidemiology

- Buckeye rot is favored by warm, wet weather.
- Temperatures 24 and 30 °C are ideal for the fruit rot.
- In order for sporangia to be produced, allowing the pathogen to reproduce, the soil must be wet and above 18 °C
- Zoospores can only disseminate by swimming in water, so excessive rain and irrigation promote growth of the disease
- Oospores, on the other hand, can be spread across a field by water runoff, farming equipment, and workers.

# Management

- Crop rotation
- Deep summer ploughing
- Removal of infected crop debris
- Proper drainage
- Selection of healthy seeds
- Resistant cultivars
- Seed treatment with mancozeb
- Foliar application of Ridomil (0.1%)
- Soil application of Trichoderma bioformulation @ 25kg/ha

A close-up photograph of a hand holding several tomatoes. The tomatoes are in various stages of ripeness, with some being bright green and others showing a mix of green and red. The hand is positioned in the upper right corner, and the tomatoes are clustered together. The background is dark and out of focus, showing more tomato plants.

# Leaf curl

---

# Causal organism

- *Tomato leaf curl virus* (**ToLCV**)

Devendra

# Symptom

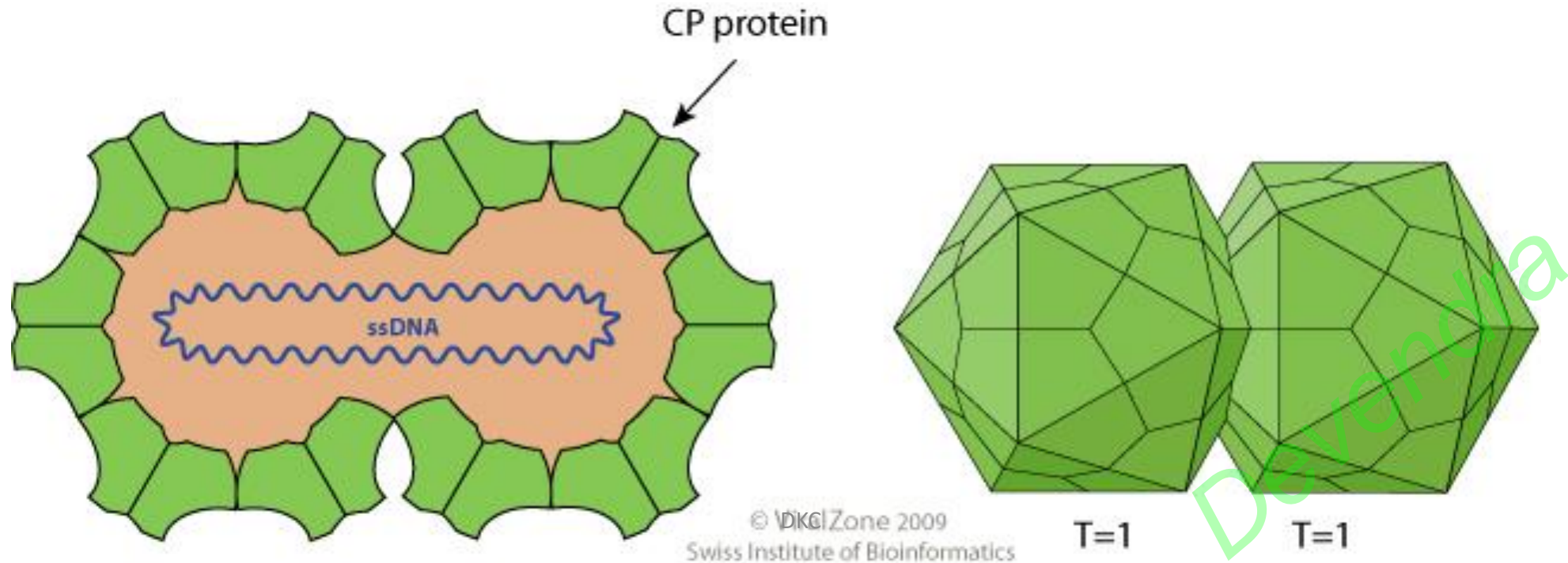
- Infected leaves shows **rolling**, crinkling, drooping
- The newly emerging leaves exhibit slight yellow coloration and later they also show curling symptoms.
- Older leaves become leathery and brittle.
- The nodes and internodes are significantly reduced in size.
- The infected plants look pale and produce more lateral branches giving a **bushy appearance**.
- The infected plants remain stunted.



Devendra

# Etiology

- *Tomato leaf curl virus*
- Genome – SS-DNA, Circular
- Capsid – geminate of two Spherical particle ,  $30 \times 18\text{nm}$
- Transmission – White fly (*Bemisia tabaci*)



# Disease cycle

- It is neither seed nor sap transmissible.
- But seeds from fresh fruits having infection may have the virus on the seed coat.
- The virus is transmitted by white fly, ***Bemisia tabaci*** and grafting.
- Even a single viruliferous insect is able to transmit the virus.

**Virus survive in collateral  
and weed host**

**Non- viruliferous insect feed  
on infected plant and  
become viruliferous**

**Multiplication of Virus in  
Plant**

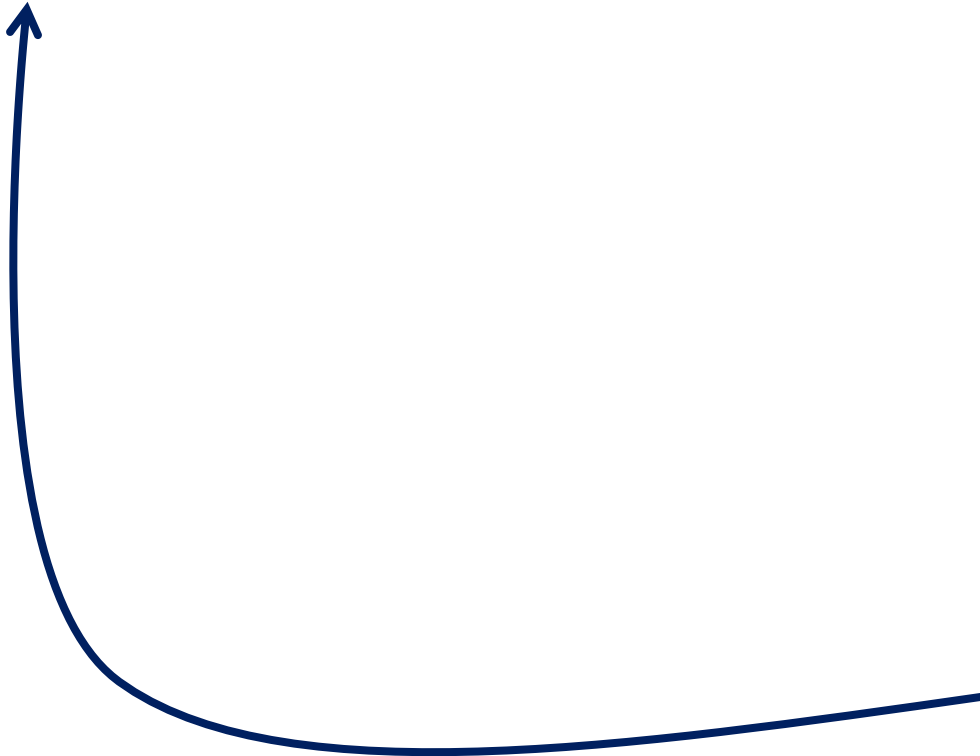
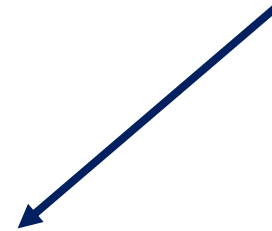
**Secondary  
cycle**

**Symptom development**

**Non- viruliferous insect feed  
on infected plant and  
become viruliferous**

**Disease cycle of Leaf curl**

Devendra



# Epidemiology

- Presence of virus
- Dense planting
- High dose of Nitrogenous fertilizer
- Variety susceptible to Insect
- High relative humidity
- Cloudy days

# Management

- Crop rotation
- Raise nursery in protected area / mosquito net
- Spray Imidacloprid
- Rouging of infected plants
- Use disease free planting material (Seeds)
- Sanitation
- Removal of weeds



# Tomato mosaic

---



# Causal organism

- ***Tomato mosaic virus (ToMV)***

Devendra

# Symptom

- The disease is characterized by light and green mottling on the leaves
- The leaflets of affected leaves are usually distorted, puckered and smaller than normal.
- Newly emerged twig becomes smaller and pale yellow
- The affected plant appears stunted, pale green

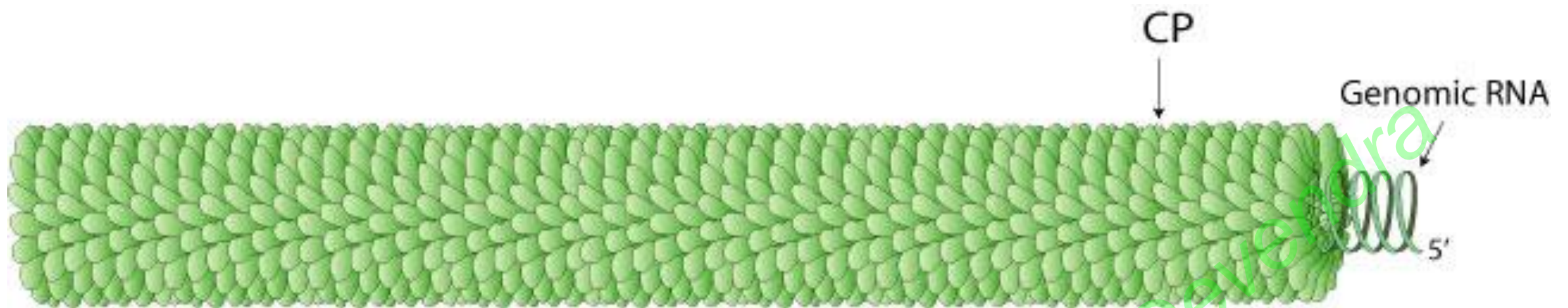


DKC

Devendra

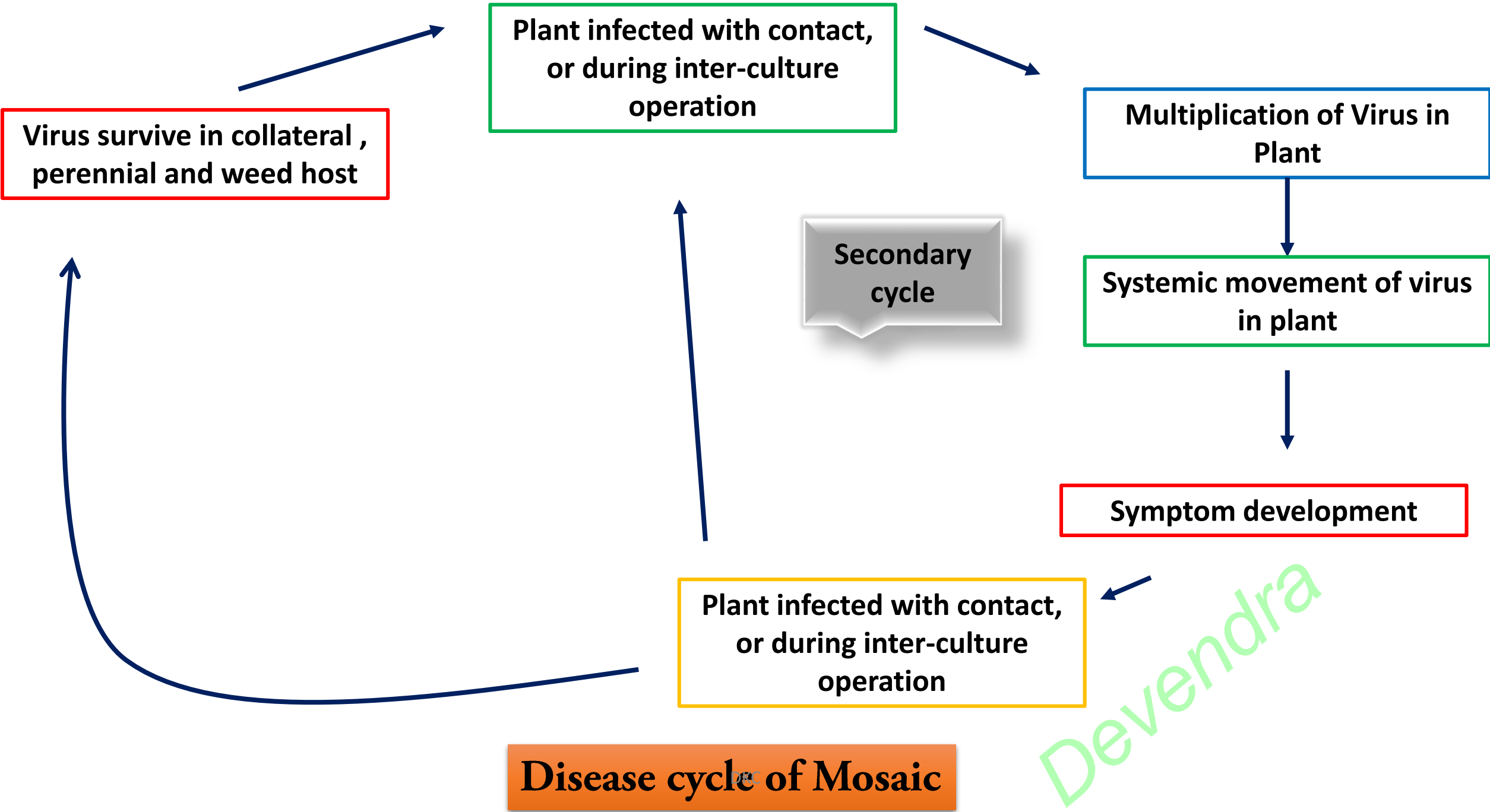
# Etiology

- *Tomato mosaic virus* (ToMV)
- Genome – SS-RNA, 6.4 kb
- Particle – Rod shaped (18 × 300 nm) (5% RNA + 95% Protein)
- Transmission – Mechanical, Contact



# Disease cycle

- The virus is seed borne and upto 94% of seeds may contain virus.
- The virus infection occurs during transplanting
- Many solanaceous plants are susceptible to tomato mosaic virus.
- The virus is spread easily by man and implements in cultural operations or by animals and by leaf contact.



# Epidemiology

- Dense planting
- Presence of virus

# Management

- Use disease free planting material
- Sanitation
- Removal of weeds
- Raise nursery in protected area / mosquito net
- Rouging of infected plants
- Sterilization of tools before each use
- Crop rotation



DKC

**Thank  
You**