

Salahaddin University \Erbil  
College of Agriculture  
Plant protection Department  
4<sup>th</sup> class



# Plant Bacterial Diseases\Practical Diseases caused by *Erwinia* spp. 3rd lecture

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# *Erwinia* spp.

- *Erwinia* is a genus of Enterobacterales bacteria containing mostly plant pathogenic species which was named for the famous plant pathologist, (Erwin Frink Smith).
- It contains Gram-negative bacteria.
- They are primarily rod-shaped bacteria.
- Many infect woody plants. A well-known member of this genus is the species *E. amylovora*, which causes fire blight on apples, pears, and other Rosaceae crops.

# *Erwinia spp.*

## Scientific classification

- **Domain:** Bacteria
- **Phylum:** Proteobacteria
- **Class:** Gammaproteobacteria
- **Order:** Enterobacterales
- **Family:** Erwiniaceae
- **Genus:** *Erwinia*

# Some important characteristics of *Erwinia* spp.

## Microscopic appearance:

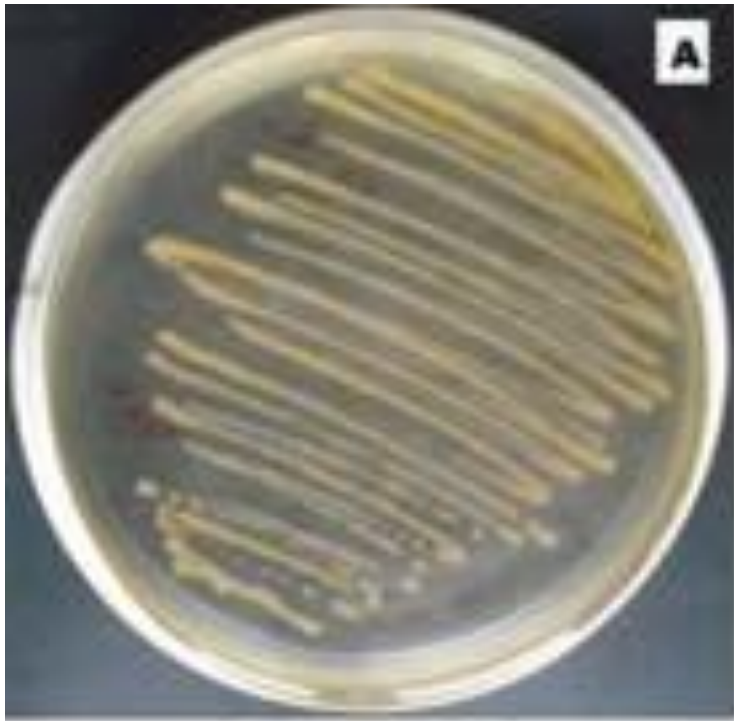
- Gram negative
- Rod shaped
- Motile by flagella (except *E. stewartii*)
- Their size is about 0.5-10 micrometer.
- No capsule
- No spore
- They occur singly or in pair and sometime in short chain.

# Some important characteristics of *Erwinia* spp.

Colony appearance :

- Colony morphology for these organisms vary depending upon the type of media on which they are cultivated.
- In general the colonies appear as white, smooth colonies.
- Pigments may be produced by some species, ranging from cream, pale yellow to light pink.

# Colony appearance



A) Culture of *E. carotovora* on nutrient agar medium



B) Culture of *E. amylovera* on King B medium

# Biochemical tests of *Erwinia sp.*

<b><u>Oxidase</u></b>	negative
<b><u>Methyl red</u></b>	negative
<b><u>Glucose</u></b>	positive
<b><u>Maltose</u></b>	positive
<b>Catalase</b>	positive

# Some important species of plant pathogenic *Erwinia*

- ***Erwinia amylovera*** : fire blight of pear and apple
- ***E. carotovera*** : rhizome rot or tip over disease of banana.
- ***E. herbicola*** : internal discoloration of tomato.
- ***E. stewartii*** : Stewart's wilt of corn .
- ***E. carotovera pv. carotovera*** : soft rot of carrots, onions, potatoes, peppers



# Diseases caused by *Erwinia* spp.

## 1. Fire blight of pear and apple :

Pathogen : *Erwinia amylovera*

### Symptoms :

- The first sign of infection is a blossom with a water soaked appearance.
- If the infection is not controlled and the infection progresses the blossom, shoots and branches wilt ,ooze and die.
- *Erwinia amylovera* can survive over winter in **cankers** and become an active infection again in spring.

# Symptoms

- The affected areas of the plant appear shriveled and blackened as if they were scorched by fire, hence the term **Fire blight**.
- **Primary infection** occurs when the bacterium enters the plant via open stomata.
- The death of the plant often occur once the roots had been invaded.

# Symptoms of fire blight



# Symptoms of fire blight







Blossom blight on flower cluster with apple shoot declining from internal infection spreading

Fire blight canker around a pruning cut on apple twig with damp bacterial ooze.



# Diseases caused by *Erwinia* spp.

## 2. Rhizome rot or tip over disease of banana:

Pathogen: *Erwinia carotovera*

### Symptoms :

- the pathogen is soil borne.
- the affected plants show discoloration and soft rotting of rhizomes and suckers.
- They have scanty roots with dark brown lesions and necrotic tips.
- The entire roots get blackened and rotted.
- In severe cases toppling of the whole plant can happen.





**Crown rotting**



**Drying of leaves**



## Soft rotting of suckers



# Diseases caused by *Erwinia* spp.

## 3-Internal discoloration of tomato

Causal agent: *Erwinia herbicola*

### Symptoms

- internal discoloration characterized by blackening of the vascular vessels of tomato fruits.
- Fruits have healthy appearance but when cut they showed vascular and seed discoloration.

Typical symptoms of natural infection of tomato fruits with *E. herbicola*.



# Diseases caused by *Erwinia* spp.

## 4- Stewart's wilt of sweet corn (maize)

**Pathogen** : *Erwinia stewartii*

**HOSTS**: corn (*Zea mays*)

### **Symptoms and Signs:**

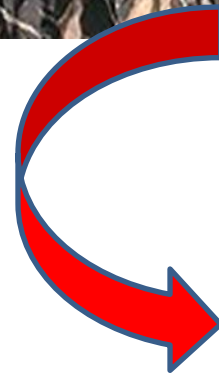
- two phases of Stewart's wilt occur on corn:
- The **seedling wilt** phase occurs when young plants are infected systemically
- The **leaf blight** phase occurs when plants are infected after the seedling stage .
- Infection occurs in plant tissues that are wounded during feeding by an insect ,the corn flea beetle
- The corn flea beetle is the overwintering host and vector of *Erwinia stewartii*, the bacterium that causes Stewart's wilt.

# Symptoms and Signs

- Leaf tissue surrounding feeding wounds initially become water-soaked Pale-green to yellow linear streaks with irregular or wavy margins develop parallel to leaf veins.
- these lesions become necrotic with age and may extend the entire length of the leaf on susceptible cultivars.



The 'leaf blight' phase  
of Stewart's wilt on  
two sweet corn



The 'seedling wilt'  
phase of Stewart's  
wilt occurs when  
seedlings are  
systemically infected  
by *Erwinia stewartii*.

the corn flea beetle is the overwintering host and vector of *Erwinia stewartii*.



Flea beetle feeding wounds on a corn leaf



Cavities may form near the soil line in the stalks of plants systemically infected by *Erwinia stewartii*.

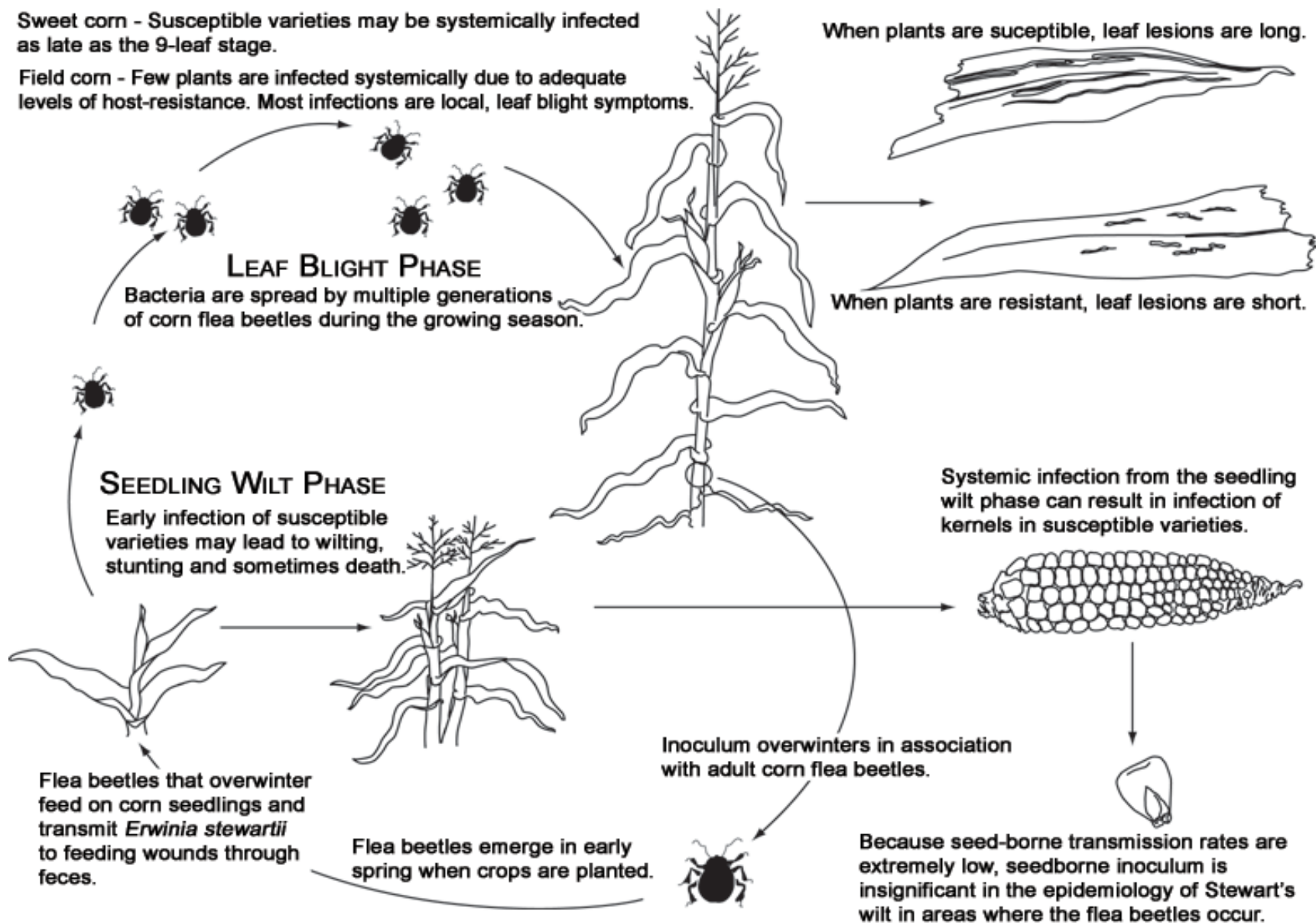




# Disease Cycle and Epidemiology

Sweet corn - Susceptible varieties may be systemically infected as late as the 9-leaf stage.

Field corn - Few plants are infected systemically due to adequate levels of host-resistance. Most infections are local, leaf blight symptoms.



# Diseases caused by *Erwinia* spp.

## 5- Bacterial Soft Rot:

Pathogen : *E. carotovera* pv. *carotovera*

Hosts : carrots, pepper, potatoes, onion and leek

### Symptoms :

- On carrots bacterial soft rot appears slimy decay of the taproot.
- The decay rapidly consumes the core of the carrot often leaving the epidermis intact.
- A foul odor may be associated with soft rot.
- Aboveground symptoms include a general yellowing ,wilting, and collapse of leaves.



Rapid decay that consumes the core of the carrot, often leaving the epidermis intact

Soft, watery, slimy rot on the taproot

# Diseases caused by *Erwinia* spp.

## Symptoms on onion:

- the bulb intended crops are affected towards the end of the vegetation period.
- When sectioning the bulb, during this period, you will observe that some peels are thicker and have a different color than the others; these peels even seem moist and sunken.
- If the bulbs are severely affected the base disc will sink when pressing.
- the bulbs that have been partially affected can completely rot if stored in humid warehouses, The affected bulbs will release a strong, unpleasant smell.



Bacterial soft  
rot on Onion





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bacterial soft rot  
(*Erwinia carotovora*) in  
part of a section  
potato tuber



Bacterial soft  
rot on Potato