

Insect of Plant diseases Transmission

Lect. 4

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Remember

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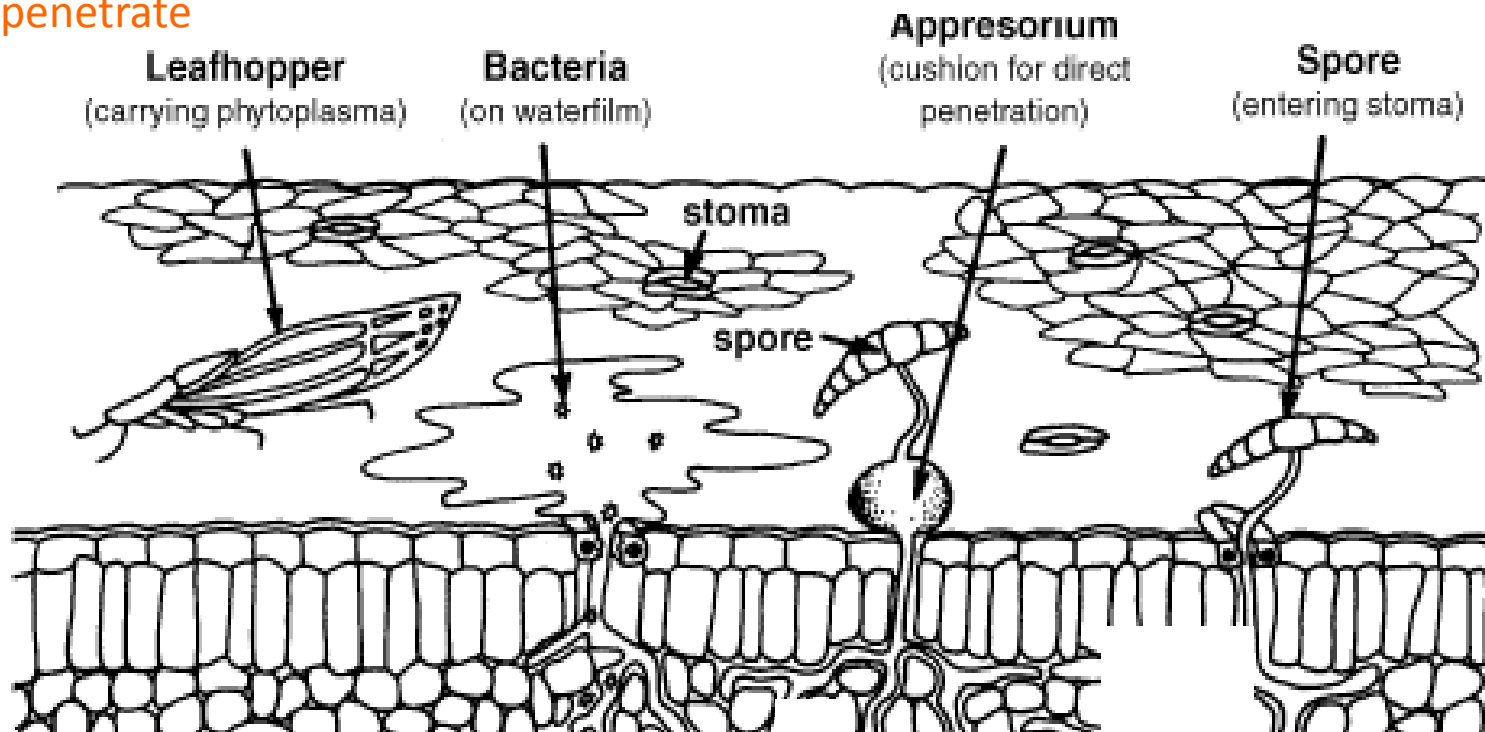
Remember

How do pathogens enter plant?

Leafhopper

(insect vector)

Use mouth parts to
penetrate



↑
stoma
(pl. = stomata)

↑
leaf epidermis

↓
hyphae



How do pathogens enter plant?

Leafhopper

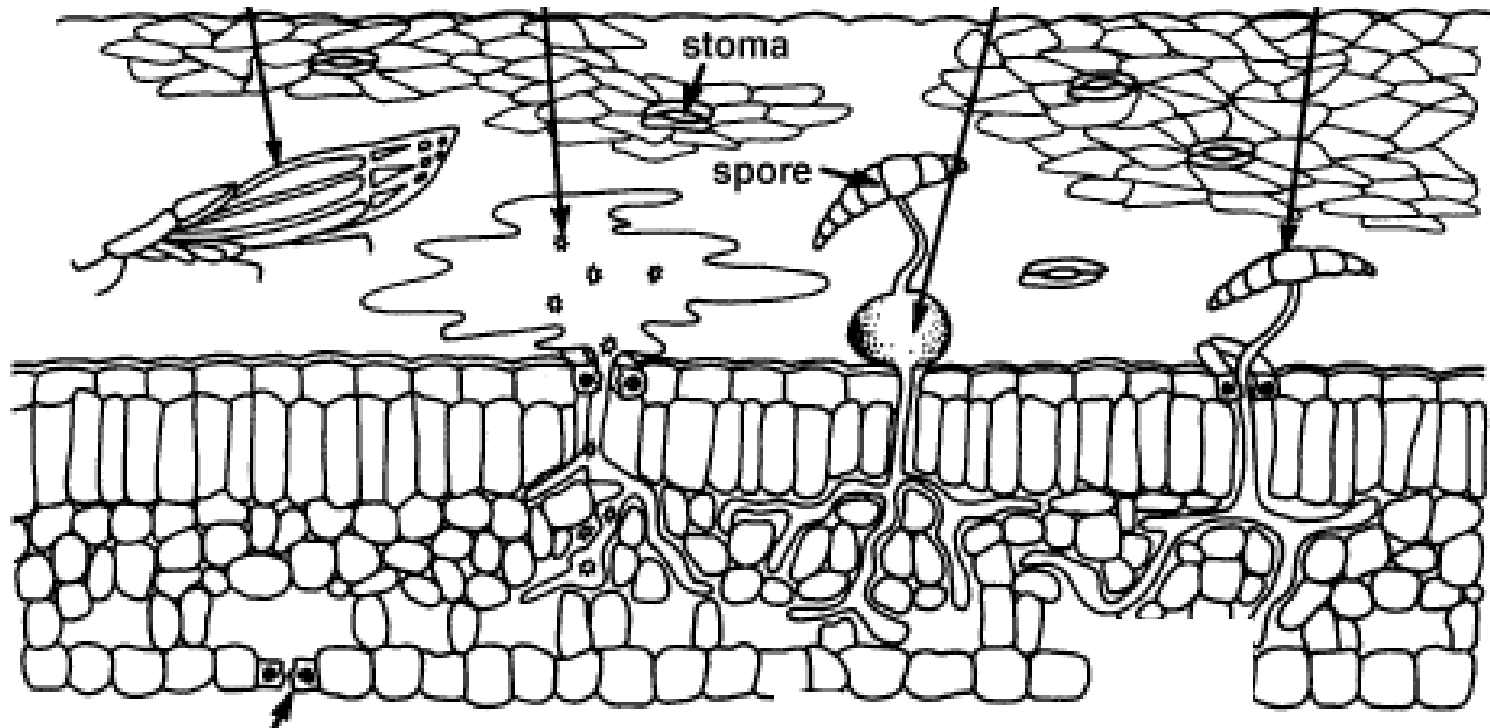
(insect vector)

Use mouth parts to
penetrate

Bacteria

on water film,

enter
through stomata



How do pathogens enter plant?

Leafhopper

(insect vector)

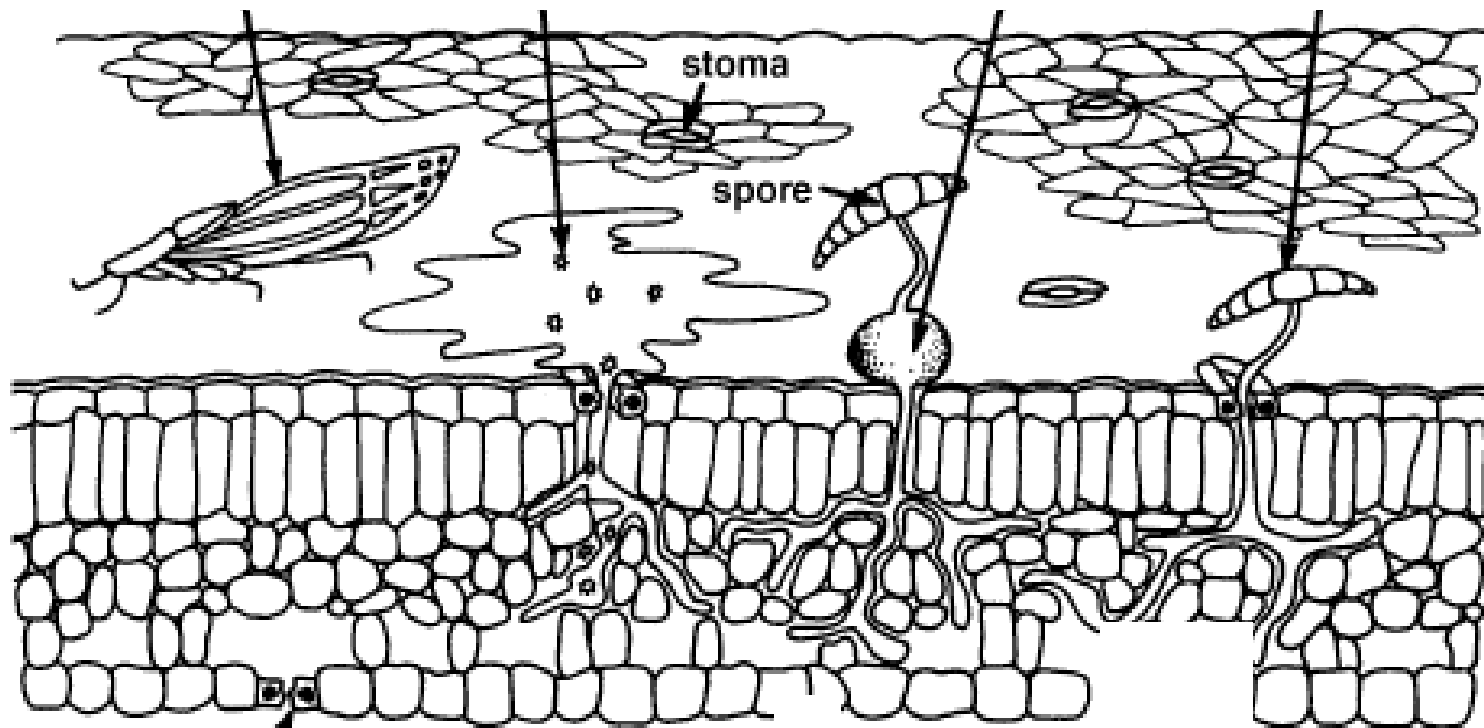
Use mouth parts to penetrate

Bacteria

on water film, enter through stomata

Fungal Spore

entering through stoma



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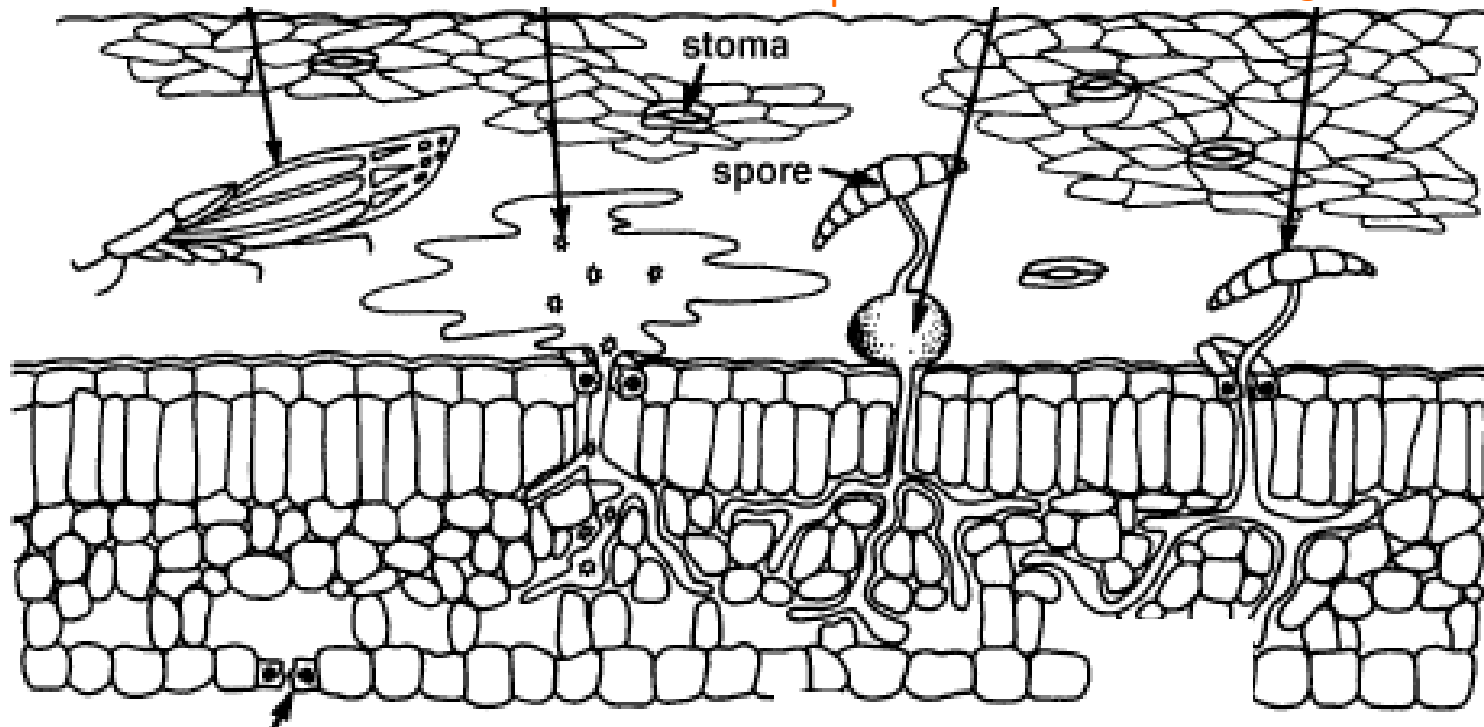
on water film, enter through stoma

Appressorium

fungus structure from spore for direct penetration

Fungal Spore

entering through stoma



Remember

!!!

- **Insects transmit plant pathogens in three main ways:**
 - 1) Many insects transmit bacteria and fungal spores passively by feeding on or walking through an infected plant area.
 - 2) Some insects transmit certain bacteria, fungi, and viruses by feeding on infected plant tissues and carrying the pathogen on their mouthparts as they visit and feed on other plants or plant parts.
 - 3) Several insects transmit specific viruses, phytoplasmas, protozoa, nematodes, and xylem- and phloem-inhabiting bacteria by ingesting (sucking) the pathogen with the plant sap they eat.



Bacterial wilt of corn

“Stewart’s wilt of corn”

- **Bacterial wilt of corn**
occurs in North, Central America, Europe and China
- **caused by:**
the bacterium *Erwinia stewartii*.
- **Symptom:**
- At the seedling stage corn may wilt rapidly and may die
- Develop pale green wavy streaks on the leaves, become stunted, wilt, and may also die.



Bacterial wilt of corn

“Stewart’s wilt of corn”



Insect Role

- corn flea beetle,
Chaetocnema pulicaria Melsheimer
- the spotted cucumber beetle
(*Diabrotica undecimpunctata howarti* Barber)
- by the larvae of the seed corn maggot
(*Delia platura* Meigen)
- wheat wireworm
(*Agriotes mancus* Say)
- the May beetle
(*Phyllophaga* sp.)



Insect Role



Chaetocnema denticulata Illiger



Delia platura Meigen



Diabrotica undecimpunctata howarti

3/21/2020



wheat wireworm (*Agriotes mancus* Say)



How do pathogens enter plant?

Leafhopper

(insect vector)

Use mouth parts to penetrate

Bacteria

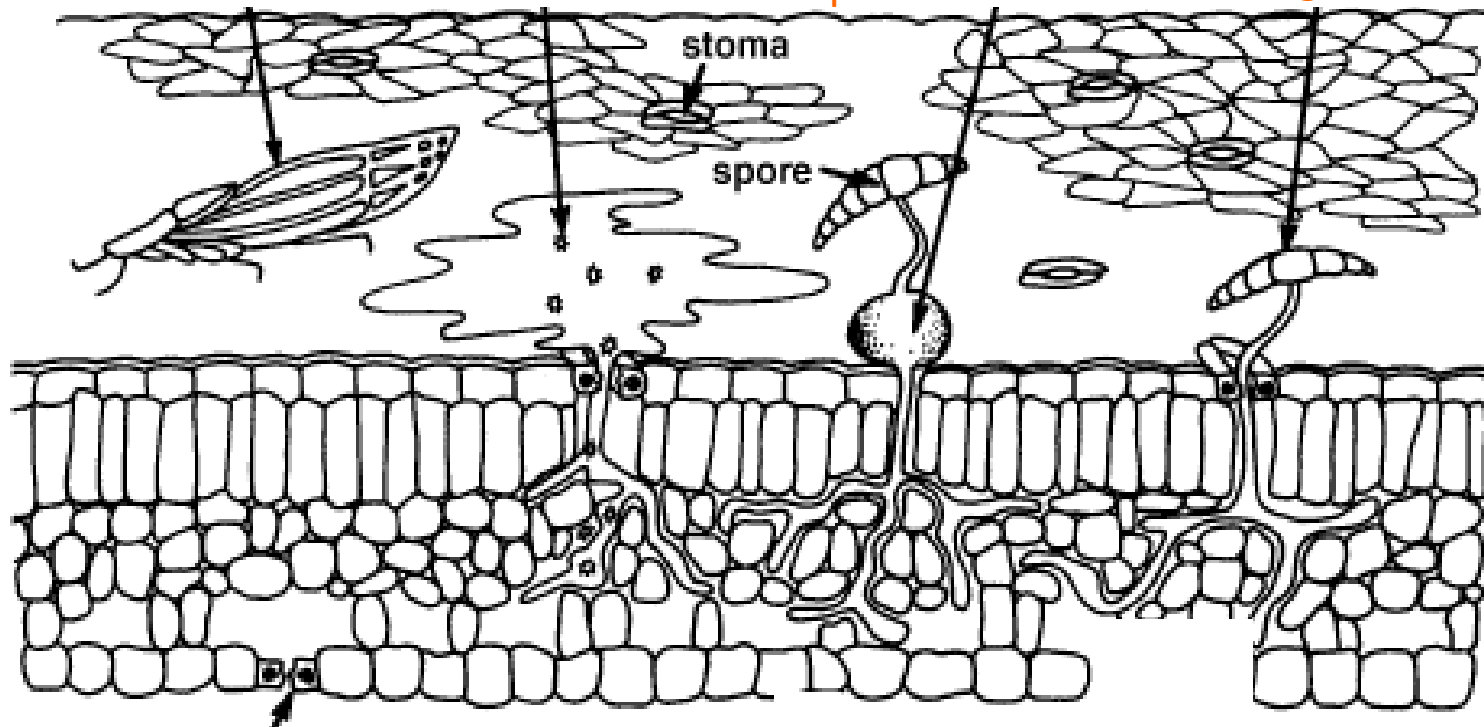
on water film, enter through stoma

Appressorium

fungus structure from spore for direct penetration

Fungal Spore

entering through stoma



Bacterial wilt of cucurbits

- **Bacterial wilt of cucurbits:**
 - Global diseases
 - It affects many species of cucurbits, including cucumber, muskmelon, squash, and pumpkin.
 - Watermelon is resistant or immune to bacterial wilt.
- **caused by:**
 - the bacterium *Erwinia tracheiphila*.
- **Symptoms:**
 - Diseased plants develop a sudden wilting of their foliage and vines and eventually die.
 - Diseased squash fruit develops a slimy rot in storage.
 - Losses from bacterial wilt vary from an occasional wilted plant to destruction of 75 to 95% of the crop.



Bacterial wilt of cucurbits



Insect Role

- The bacterium survives in infected plant debris for a few weeks
- over winter in the intestines of its two insect vectors,
- the striped cucumber beetle (*Acalymma vittatum* [Fabricius])
- the spotted cucumber beetle (*Diabrotica undecimpunctata* Mannerheim [Coleoptera: Chrysomelidae]).



the spotted cucumber beetle



the striped cucumber beetle



Insect Role

- In the spring:
- Striped cucumber beetles and, to a lesser extent, spotted cucumber beetles carry bacteria, feed and cause wounds on the leaves of cucurbit plants.
- The insects deposit bacteria in the wounds through their feces and the bacteria enter the wounded xylem vessels in which they multiply rapidly and through which they move to all parts of the plant.



Insect Role

In the xylem,

The bacteria excrete **polysaccharides**, secrete **enzymes** that break down some of the cell wall substances, and induce xylem parenchyma cells to produce tyloses in the xylem. All of them together form gels or gums that clog the vessels, especially at their end walls, thereby reducing the upward flow of water in the xylem by up to 80% and causing the leaves and vines to wilt.



Fire blight of pears, apples and other rosaceous plants

- **Fire blight of pears**

occurs in North America, Europe and countries surrounding the Mediterranean Sea, and in New Zealand

- **caused by:**

- *Erwinia amylovora*. Fire blight.

- **Symptom**

- infected blossoms and young shoots becoming discolored and water-soaked

- appearing brown to black as though scorched by fire



Fire blight of pears, apples and other rosaceous plants



Insect Role

- More than 200 species belonging to many insect groups, including aphids, leafhoppers, psyllids,
- beetles, flies, and ants, have been shown to visit oozing cankers and healthy blossoms



Olive knot

- **Olive knot:**

disease on olive, *Olea europaea*, is distributed in olive-growing regions worldwide, and reports of the disease in California date back to the late 19th century.

- **caused by:**

Pseudomonas savastanoi pv. savastanoi (Psv),

Symptom:

The development of galls, or "knots," at infection sites.
Galls.





Olive knot galls form on twigs at sites of infection by *Pseudomonas savastanoi*.



Gall tissue can girdle twigs.

3/21/2020



Insect Role

- *Dacus oleae*

Pseudomonas savastanoi is closely associated with all developmental stages of the olive pest

Dacus oleae (Gmel.).



Lüthy et al 1983



Insect – Plant Fungus Relation transmission relation

1- Infection incident to Pollination

a- Simple method of insect transmission of pathogen.
e.g. *Blastophaga* sp. Transmit *Fusarium moniliform*

Which cause Endosepsis



**b- bees transmit *Phytophthora phaseoli*
Causing Lima Bean Downy Mildew**



