**Plant pathology lect. 4**

# Plant defenses against pathogens

The plant is attacked by many pathogens that try to overcome the plant's defenses. The plant's defenses against pathogens are:

I- Structural Defense

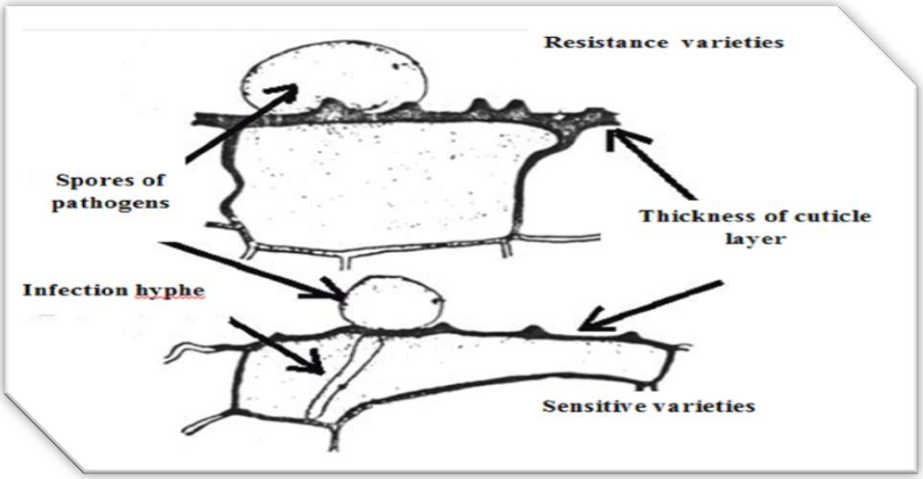
II- Biochemical Defense

## I- Structural Defense

They are natural barriers that prevent the pathogen from Penetration of the plant pathogen as well as spread within it. Divided into:

### A- The defense combinations are already present in the plant.

These structures represent the first defense lines in plants against the attack of pathogens, and include :

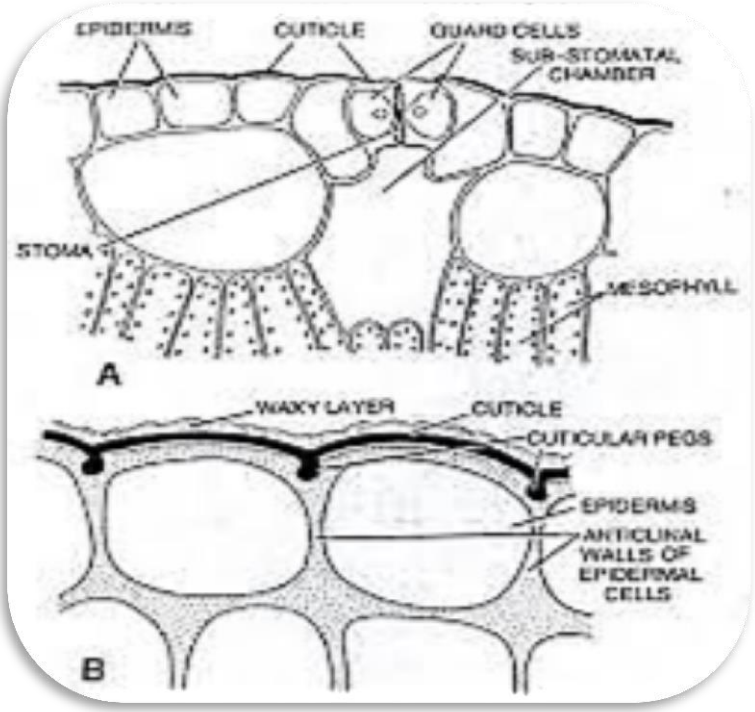



### 1- Cuticle

Thickness of cuticles layers outside epidermal cells give resistance to plants verities against pathogens as compere with sensitive plants which have cuticle layers less thickness

**2- Wax**

There is wax on the surface of the leaves and fruits, and forming the outer cover of the epidermis cells, a substance repellent water and thus prevents the pathogenic organism stability or germination on those surfaces. But the pathogen uses the mechanical pressure to penetrate the surface of the plant.

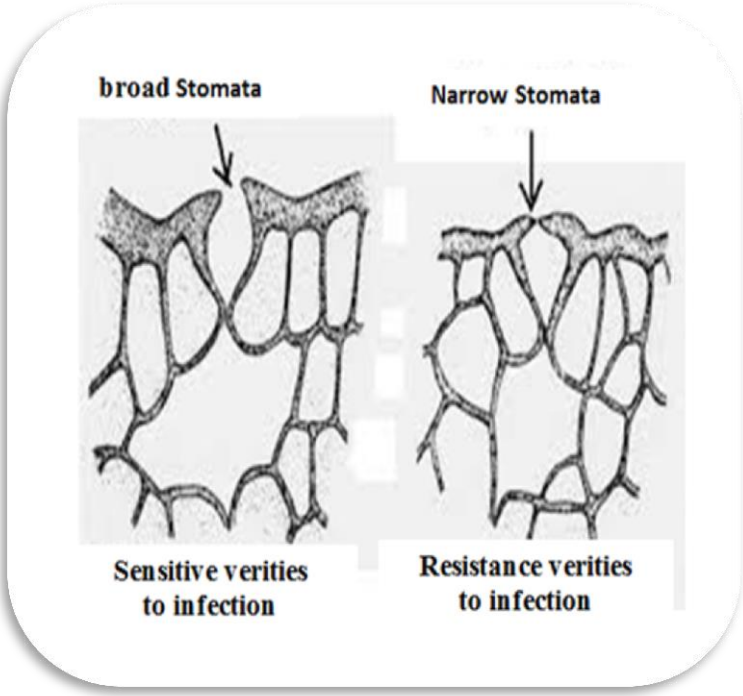



**3- Cell wall**

The thickness and hardness of the outer wall of the epidermis cells are important factors in the resistance of some plants against some pathogens, because of the lignification with lignin , which gives the cell wall more solid.

## 4- Stomata and Lenticel

The delay in the opening of the stomata during the day in some wheat varieties is considered resistance to the inability to enter the fungus causing the disease of rusting stems in wheat because of the drought of pathogen germ tube that germinated during the night with dew, the evaporation of the dew cause dry the germ tube before the stomata opining. The small opening of stomata gives resistance to some species against some of the pathogens.




## 5- leaves trichomes

The presence of these trichomes in heavily level on the leaves in some varieties of tomatoes and potatoes are more resistant to those varieties with few numbers such as in late blight disease.

**B- Defensive structures formed as response to pathogen infection ,** These structures include:

1- Cellular Defensive structures

2- 2- Cytoplasmic defense reactions

3- Cellular defense installations

4- 4- High sensitivity defense reactions

**1- Cellular Defensive structures**

These structures are formed in front of or around the lesion pathogen in the plant, such as cork layers, separation layers, tylosis formation, glomerular deposition .

**A - Forming of cork layers**

As a result of infecting the plant with pathogens such as fungi, bacteria, viruses, and nematodes, the plant often causes the formation of several layers of cork cells behind the lesion.

These layers form thick barriers that can not be broken by the pathogen. These layers prevent the spread of any toxic substances from the pathogen, and also prevent the access of nutrients and water from healthy areas to infected, thus preventing the pathogen from nutrition, which cause inability to infection.

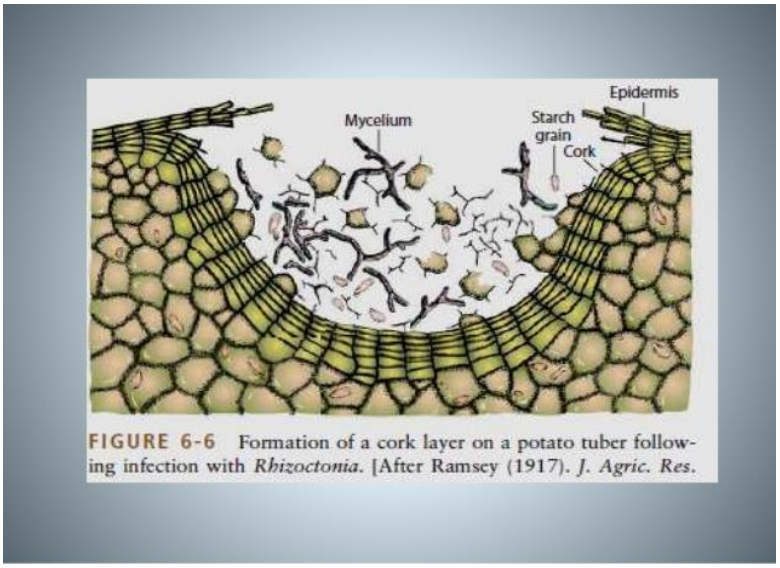



FIGURE 6-6 Formation of a cork layer on a potato tuber following infection with *Rhizoctonia*. [After Ramsey (1917). *J. Agric. Res.*

In some host–pathogen combinations the necrotic tissues are pushed outward by the underlying healthy tissues and form scabs that may be sloughed off, thus removing the pathogen from the host completely.
Eg. Cypress trees canker caused by the fungus *Seiridium cardinale*

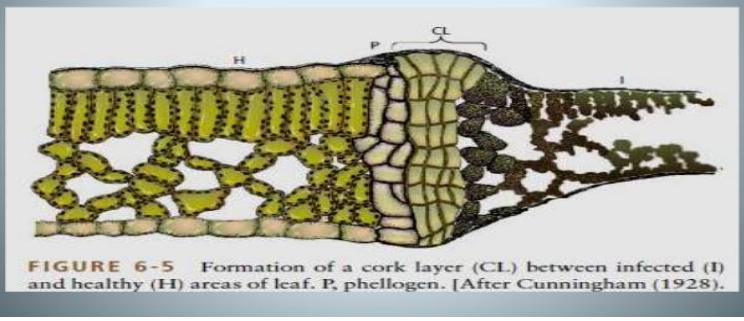
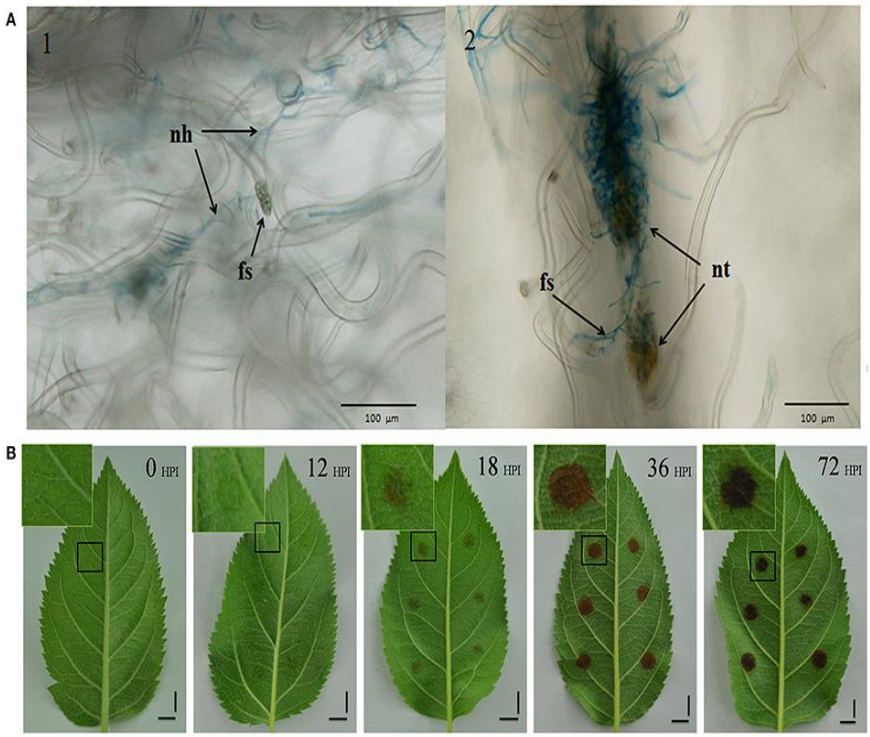



FIGURE 6-5 Formation of a cork layer (CL) between infected (I) and healthy (H) areas of leaf. P, phellogen. [After Cunningham (1928).

## B- Forming detachable layers

These layers are formed in active cells of the modern leaves of some trees after infection with fungi, bacteria or viruses to prevent the movement of the pathogen. After that, the separation layer surrounds the infection part and falls, leaving the area of the infection ,such as Shot hole diseases.




## C- Forming tylosis

Tylosis was excessive growths initiation from the expansion of the membrane of the parenchyma cells adjacent to the xylem vessels through pits. . These growths occur when the pathogen is present in the vascular tissue and impede the movement of the pathogen. As in the case of plants resistant to vascular wilt disease caused by fungi or bacteria.

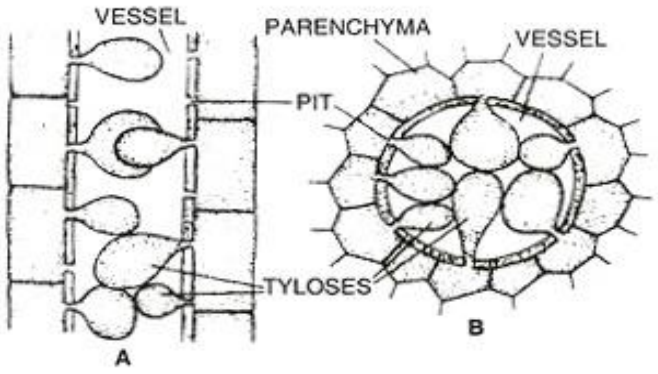



Fig. 6.32. Formation of tyloses in heartwood.
A, L.S. vessel showing tyloses.
B, T.S. vessel showing tyloses.

**D- Deposition of gums**

Different types of gums are produced by many infected plants around the area of infection, especially in stone-core trees. The sedimentation of the gums are inhibitory barrier surrounding the pathogen and becomes isolated in this area causing its death.