

MODULE 3

DEFENCE MECHANISM IN PLANTS.

- ▶ Resistance of plants to harmful effects of other organisms seems to be rule while susceptibility to such effect on exception.
- ▶ The attacked individual may suffer partial or complete damage but other individuals in the population remain unaffected.
- ▶ No disease has been able to wipe out existence of plants species from the earth.
- ▶ This fact suggests that plants have some built-in mechanism of defence that enables them to survive in presence of so many diseases around them.

Defence Mechanism in Plants

Classification

1. Pre- infectional or pre existing defence mechanism : defence mechanism in plants prevent an infection. to

2. Post- infectional defence mechanism : defence after the plant has been infected.

or

a. Physical defence /structural barriers.

&

b. Biochemical defence .

Defence Mechanism in Plants

Classification

- 1. Pre- infectional or pre existing defence mechanism.**
 - a. Pre existing Physical /structural defence mechanism
 - b. Pre existing Biochemical defence mechanism

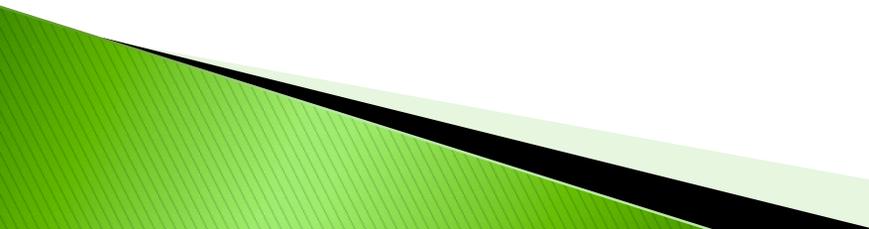
- 2. Post- infectional defence mechanism**
 - a. Post- infectional Physical /structural defence mechanism
 - b. Post- infectional Biochemical defence mechanism

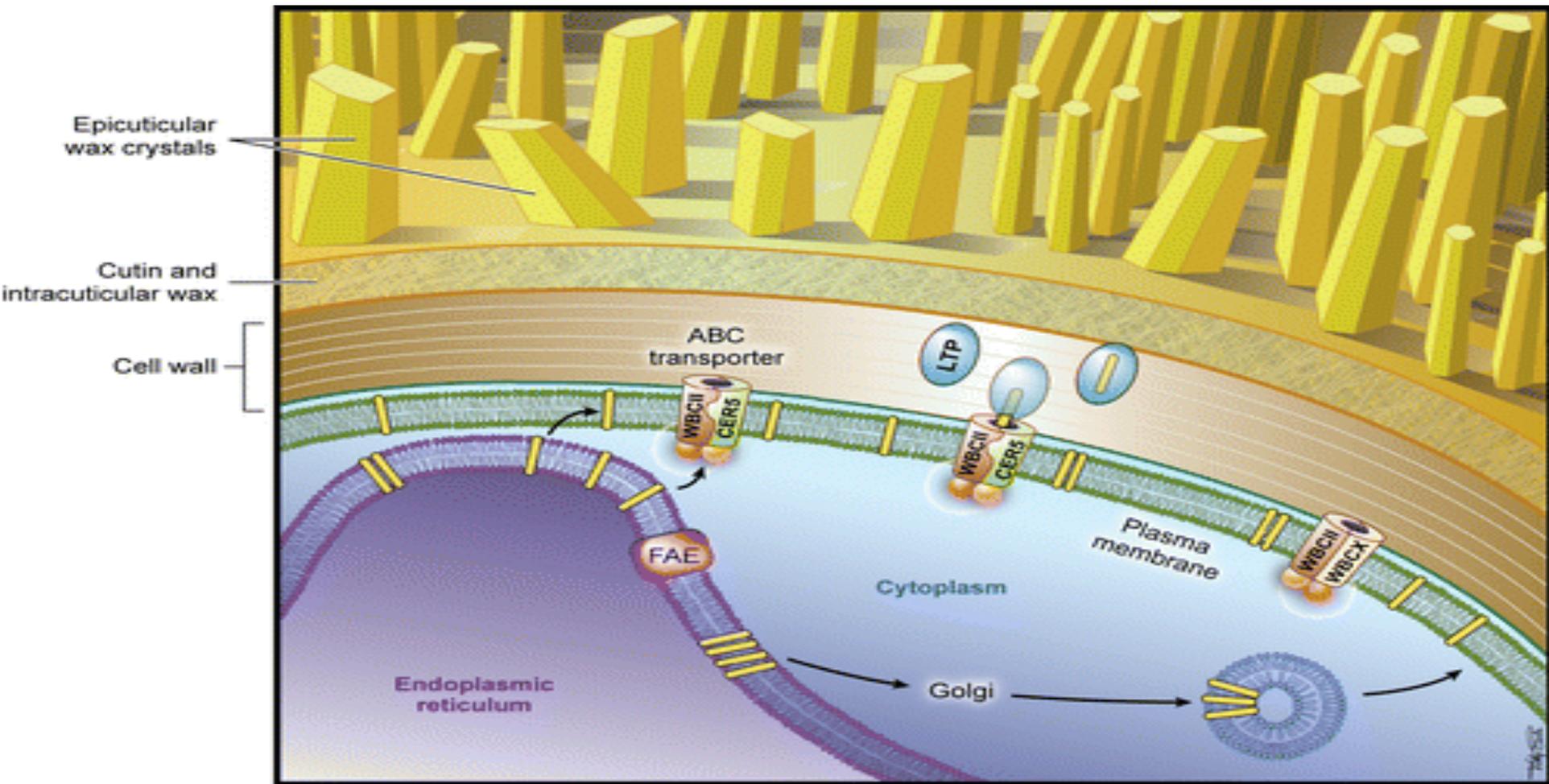


1. ***PRE-INFECTONAL OR PRE- EXISTING DEFENCE***

- Whether a plant can be successfully attacked by a pathogen or not is determined by the *genetic constitution* of the plant and pathogen.
 - In resistant varieties attack of the pathogen is controlled by *physical* as well as *biochemical substances*.
 - Structural and biochemical defence are always present in these plants regardless of the plant is affected or not.
- 

1.a.Pre-existing structural defence.

- ▶ The first line of structural defence , is present on the plant surface.
 - ▶ The structure of the epidermis along with the overlying cuticle can obstruct penetration of the pathogen.
 - ▶ Cutin and waxes which constitute the cuticle, is a thick layer which cannot be degraded by any parasitic enzymes.
- 



Annu. Rev. Plant Biol. 59:683–707.

The cuticular layer

- ▶ Due to presence of waxes in cuticle, plant surface is hydrophobic and prevents water from accumulating as a flow or drops.
 - ▶ Most fungi need water on host surface for spore germination and subsequent growth.
 - ▶ The wall layers of the epidermis are important in pre-existing structural defence.
 - ▶ The degree of defence of these wall layers depends on the thickness and toughness of wall materials.
 - ▶ The periderm formed in many perennial plant is found to be wax resistant to pathogen.
- 

1.b. Pre-existing chemical defence:

- Physiological or biochemical defence is more important for resisting invasions by plant pathogens.

Eg: Red scales of onion contains **catechol** and related compound which impart resistance to the attack of *Colletotrichum* in cells of young fruits and leaves afford resistance to pathogens.



1.b. Pre- existing chemical defence

cont...

- The other antimicrobial substances in plant cells include unsaturated lactones, saponins, glycosides etc .
 - Phenolic compounds are widely distributed in plants . They include coumarins, flavanoids, tannins, saponins etc.
- 

2. Post infectious defence mechanism:-

The defence mechanism which develops in the host tissue as a result of host parasite interaction is called host infection defence or autonomous and parasitic defence reaction. These prevent further spread of the pathogen with the host after infection

Post infectious defence mechanism

It includes

(a) Post Infectious Structural or Physical defence:

b) Post infectious biochemical defence

2. Post infectious defence mechanism:-

(a) Post Infectional Structural or Physical defence:

1. Cork Layer
2. Abscission Layer
3. Tyloses:
4. Gum deposition

b) Post infectious biochemical defence



2. Post infectious defence mechanism:-

(a) Post Infectional Structural or Physical defence:

1. Cork Layer :

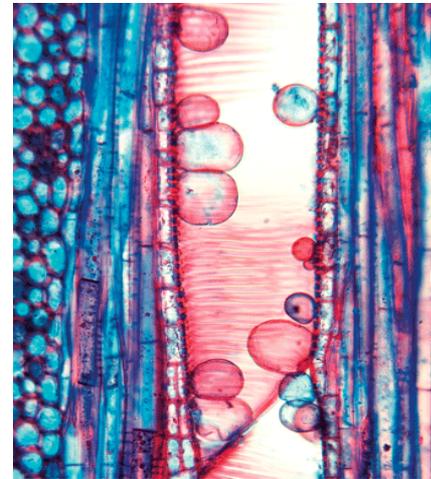
- Some bacteria, fungi and viruses stimulate host to form multilayered cork cells beyond the point of infection by substances secreted by pathogen .

2.Abscission Layer:

- ▶ Develops on an active young leaves infected by fungi, bacteria etc.
- ▶ Such layer develops at the point of infection.
- ▶ Ultimately helps discarding the infected area along with a few healthy cells from the host.



- ▶ **3. Tyloses:** They are known to develop under pathogenic stress in response to invasion to vascular pathogens.



tyloses

- ▶ **4. Gum deposition:** Plants produce variety of gummy substances around the lesions. Gum deposition is common in store fruits.

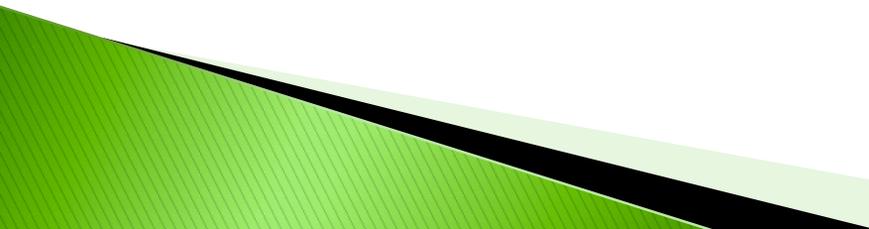
(b) Post infectious biochemical defence.

- ▶ This defence include *toxic substances* produced in response to infection.
- ▶ *Synthesis of inhibitory substances* in response to injury caused by the pathogen is the most important and common post infectious reaction of the host.
- ▶ When plant tissues are injured by a pathogen or by other means, a series of reactions start to isolate the irritant and heal the wound.
- ▶ Mostly these reactions form fungicidal substances around the site of infection.

- ▶ **Phytoalexins:-**
 - ▶ They are the common chemical substances produced in host plant interaction.
 - ▶ They are phenolic compounds which are produced in antiparasitic response.
 - ▶ In literal sense 'alexin' means to ward-off. Phytoalexin synthesis parallels the mechanism of defence through antibodies in animal system.
 - ▶ Their production is induced by any physical or chemical injury and by fungi, bacteria etc.
- 

- ▶ Phytoalexin synthesis has been found in families like Leguminaceae, Solanaceae, Malvaceae, Apiaceae, Asteraceae etc.

Example:

- **Phaseolin** from Phaseolis Vulgaris due to pathogen Sclerotinia;
 - **Isocoumarin** in Daucus carota due to pathogen Ceratocystis;
 - **Medicarpin** by Medicago sativa due to Helminthosporium
 - **Cicerin** by Cicer arietinum due to Ascochyte
- 

- ▶ Phytoalexins are produced by healthy cells adjacent to damaged or necrotic cells.
 - ▶ They are produced in response to materials diffusing from damaged cells.

 - ▶ Phytoalexin production is stimulated in host by the presence of certain pathogenic substances called **elicitors**.
 - ▶ Elicitors are generally high molecular weight substances of fungal cell wall like glucan, glycoprotein etc.
- 

THANK YOU