Insect transmission of plant diseases caused by mollicutes

- Mollicutes are prokaryotes (bacteria) that lack cell walls.
- What are they? Mollicutes — Spiroplasma, Mycoplasma and Acholeplasma — are the smallest and simplest known free-living and self-replicating forms of life.
- They are bacteria of Gram positive origin
- The mollicutes consist of about 200 systematically well-defined species
- In nature, plant pathogenic mollicutes are limited to the phloem of their host plants.

Insect transmission of plant diseases caused by mollicutes

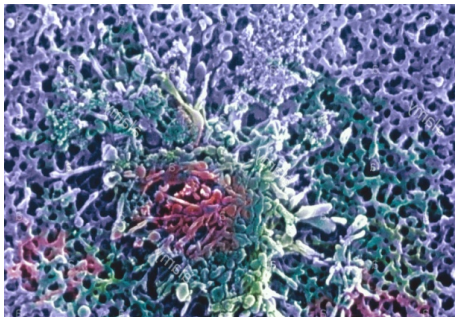
- Plant pathogenic mollicutes are generally classified as belonging to the genus Phytoplasma.
- Most phytoplasmas have an irregular spherical to elongated shape and have been obtained and maintained on complex nutrient media, although they do not readily grow or multiply on them

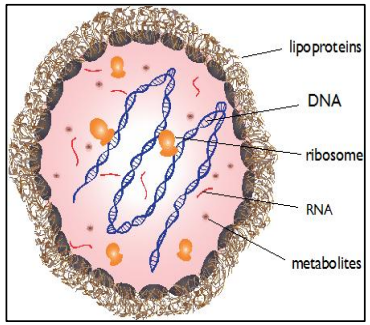
Mollicutes

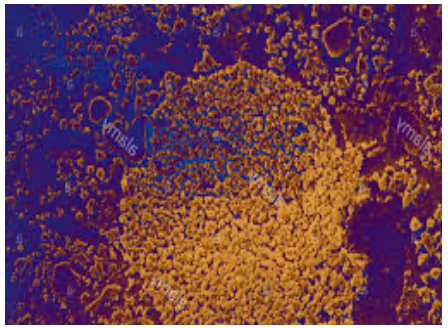
“Class of bacteria distinguished by the absence of a cell wall.”

The word "**Mollicutes**" is derived from the **Latin** words **mollis** (meaning “**Soft**") and **cutis** (meaning “**Skin**")

Very small, typically only **0.2–0.3 µm** (200-300 nm) in size and have a very **small genome size.**

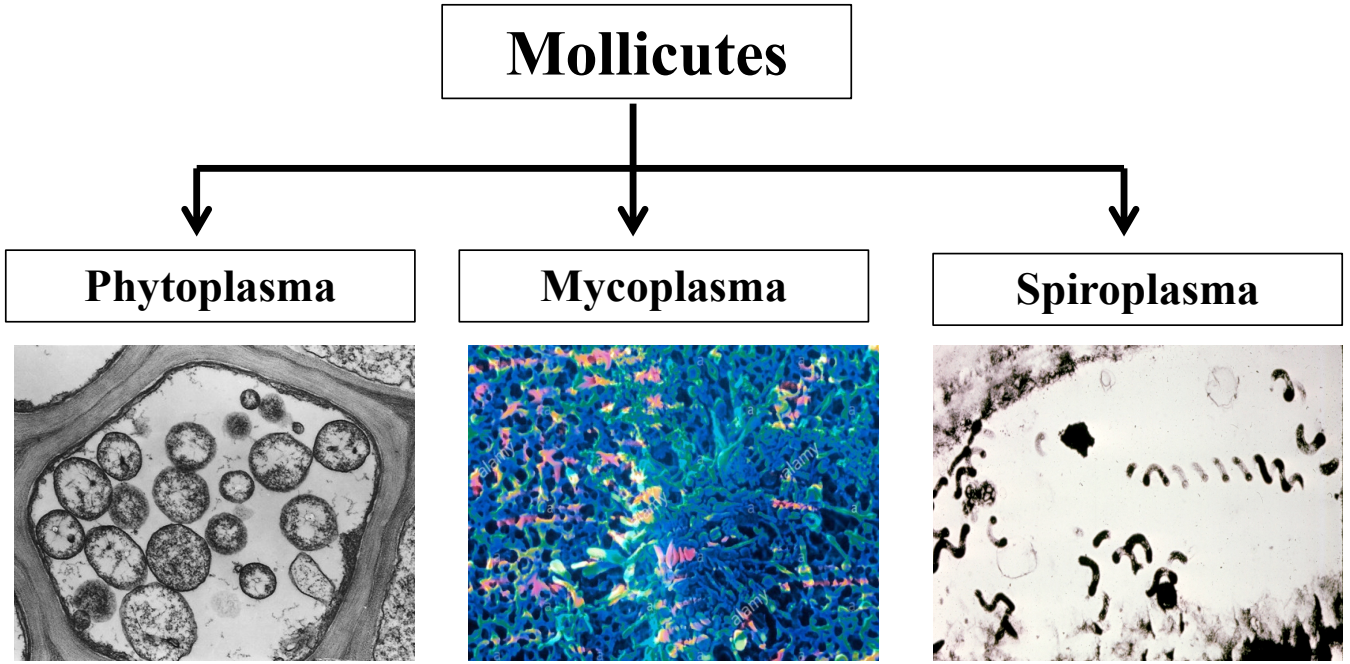






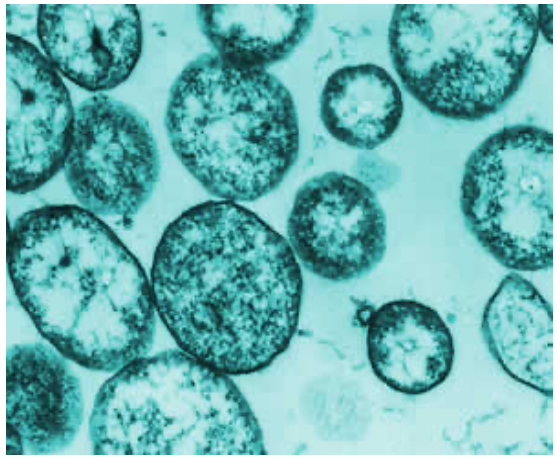
Classification

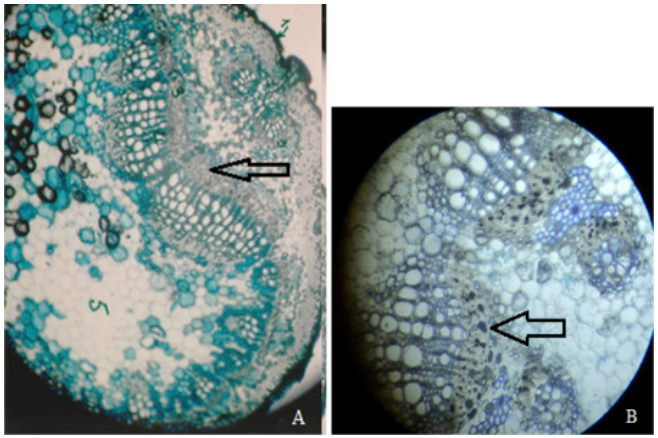
- Pathogenic Mollicutes are belonging to the genus



Phytoplasmas

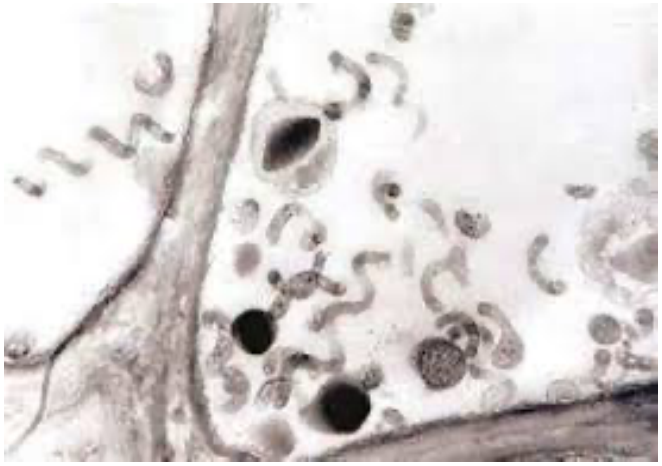
- Irregular, spherical to elongated shape
- Grow on complex nutrients media but not multiply on them

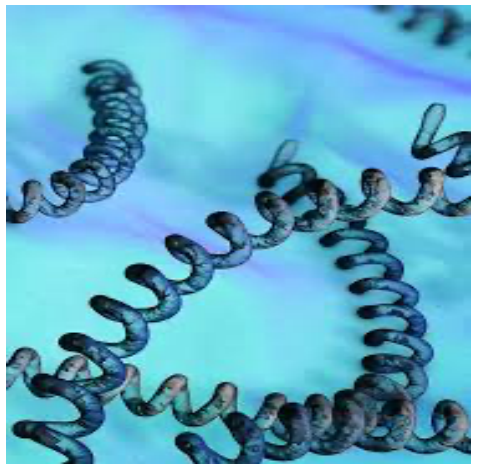




Spiroplasmas

- Spiral in shape
- Grow and multiply n specialized nutrients media





Diseased caused by *Phytoplasma*

- Aster yellows of vegetables and ornamentals
- Tomato big buds (stolburn)
- Corn stunt

On trees

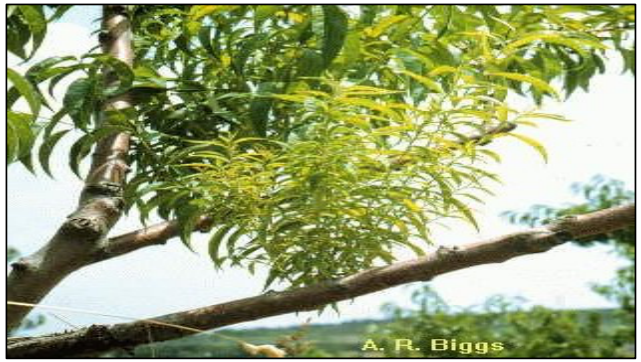
- X-disease of peach
- Peach yellows
- Apple proliferation
- Pear decline
- Elm yellows
- Lethal yellowing of coconut palms

Aster yellows of vegetables and ornamentals

Vector: Aster leafhopper

Tomato big buds

Vector: Brown Leafhopper



Yellow pear

Vector: Ash-gray leaf bugs

Apple Proliferation

Vector: Alder Spittle Bug

Lethal yellowing of coconut palms
Vector: Planthopper

Elm Yellows
Vector: Leafhopper

X-disease of peach
Vector: Mountain Leafhopper

Pear Decline
Vector: Pear Psylla

Symptoms
Appear on Mollicutes infected plants

- Yellowing of leaves
- Proliferation of shoots (Witches Brooms) and roots
- Stunting of shoots and whole plants
- Greening of flowers
- Abortion of flower and fruits
- Dieback of twigs
- Decline and death of trees

Diseases caused by *Spiroplasma* and their vectors

- Corn stunt
- Citrus stubborn disease

Corn stunt
Vector: Beet Leafhopper

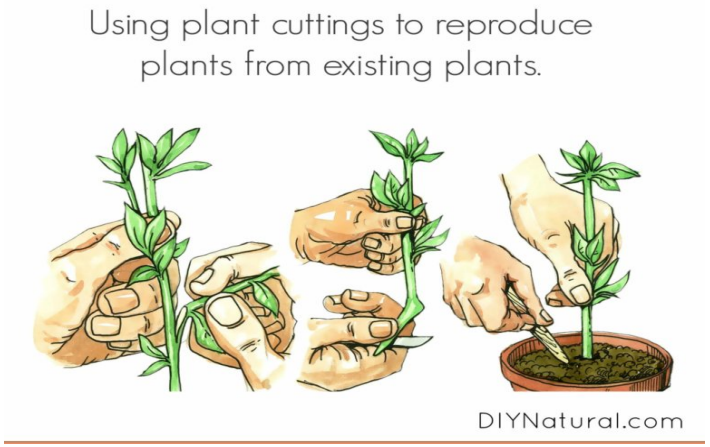
Citrus stubborn disease
Vector: Beet Leafhopper

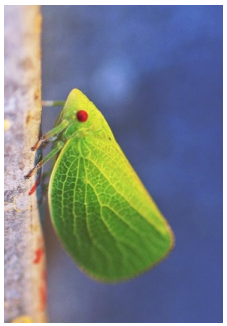
Mollicutes transmission in plants

- **Vegetative propagation**
  - ➢Cutting
  - ➢Grafting
  - ➢Layering
- **Insect vectors**

(Phloem- feeding and sap- sucking insects)

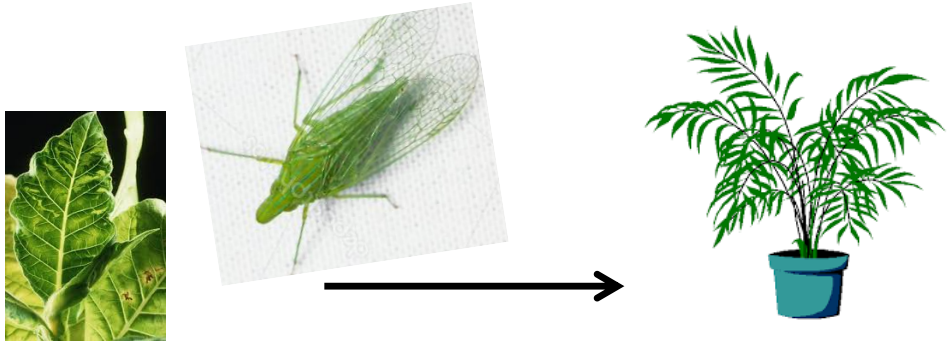
  - ➢Planthopper
  - ➢Leafhopper
  - ➢Psyllids





Mode of transmission

- Insects acquire pathogens from infected to healthy plants.



- Nymph acquire the pathogen more than adult hoppers.
- Incubation period is about 10-45 days after carrying pathogens.
- Pathogen multiply in the intestine of insect and then enter into the haemolymph.

Mode of transmission

- The insect vector cannot transmit the pathogen immediately after feeding on the infected plant but it begins to transmit it after an incubation period of 10 to 45 days, depending on the temperature.
- The quickest transmission (10 days) occurs at about 30 C, while the slowest (45 days) takes place at about 10 C.

Mode of transmission

- The reason for the incubation period is that the acquired phytoplasmas or spiroplasmas must first multiply in the intestinal cells of the insect vector and then move through the insect by passing into the hemolymph, then infect internal organs and the brain, and finally reach and multiply in the salivary glands.
- When the concentration of the pathogen in the salivary glands reaches a certain level, the insect begins to transmit the pathogen to new plants and continues to transmit it with more or less the same efficiency for the rest of its life.

Mode of transmission

- Phytoplasmas and spiroplasmas can be acquired as readily or better by nymphs than by adult leafhoppers, etc., and they survive through subsequent molts of the insect. The pathogens, however, are not passed from the adults to the eggs and to the next generation. For this reason, young insects of any stage must feed on infected plants in order to become infective vectors.