

Phytoplasma and Spiroplasma

Definitio

Phytoplasmasⁿ are obligate bacterial parasites of plant phloem tissue and of the insect vectors that are involved in their plant-to-plant transmission. Phytoplasmas were discovered in 1967 by Japanese scientists who termed them mycoplasma-like organisms (MLOs)

PHYTOPLAS

General Characters

- 1. Phytoplasmas are unicellular prokaryotic phytopathogens**
- 2. They are small in size ranging between 200-800 nm**
- 3. Phytoplasmas lack cell wall making them pleomorphic in nature**
- 4. The cell is surrounded by triple-layer lipo-protein plasma membrane**
- 5. Phytoplasmas can not be grown on artificial media making it difficult to study their biology**
- 6. Phytoplasmas do not require sterol for growth**
- 7. Phytoplasmas are generally ovoid but filamentous forms have been exceptionally observed**
- 8. The cell of phytoplasmas contains both DNA and RNA**

PHYTOPLAS

- 9. Phytoplasmas are sensitive to tetracyclines and insensitive to penicillins**
- 10. Phytoplasmas are obligate parasites of plants and insects**
- 11. Phytoplasmas inhabit phloem sieve elements or salivary glands of vector insects**
- 12. Phytoplasmas can be transmitted by grafting, dodder or insects**
- 13. Phytoplasmas are considered to be the closest relatives of *Acholeplasma***
- 14. Phytoplasmas are known to have smallest genome of all the living organisms .**
- 15. Unlike the rest of mollicutes, phytoplasma use UGA triplet code as stop codon**

Some Plant Diseases Caused By Phytoplasma

Little Leaf of Brinjal



Symptoms

- Leaves & plant become small
- Node & internodes reduce in size
- Leaves – yellowing
- Plants look like- bush
- No fruiting if form they become –small and hard



This disease is transmitted by a leafhopper (*Hishimonus phycitis*).

Contol

Healthy seeds.

Treated with Thiram @ 2g/kg of seed before sowing. Continuous raising of nursery in the same plot should be



Sesamum

Phyllody

Symptoms

- Plants are **stunted**
- Floral parts modified to leafy structures **bearing no fruits and seeds.**
- Virescence, proliferation, seed capsule cracking, formation of dark exudates on foliage and floral parts, and yellowing.

Sesame phyllody is transmitted by a leafhopper (*Orosius albicinctus*).

Prevention

- Remove all the reservoir and weed hosts.
- Avoid growing sesame near cotton, groundnut and grain legumes.
- Rogue out the infected plants periodically.



Sandal Spike

Symptoms

.The common symptom called the '**rosette spike**' is characterised by severe reduction in leaf size and reduction of internodes



The most common insect Vectors are ***Moonia***

alhimaculata and *Nephotettix virescence*.

•Control

- No specific method to control.
- Planting of Mysore gum trees (a hybrid of *Eucalyptus tereticornis*) at a distance of 10-20 metres.
- Treatment **with tetracycline** checks the disease.

Grassy Shoot of Sugarcane



Symptoms

- Proliferation of tillers, which give it typical grassy appearance.
- The leaves of infected plants do not produce chlorophyll.

Causal organism

Caused by a phytoplasma
(Candidatus
phytomonas)

Control

- Replacement by healthy plants.
- Uprooting.
- hot air treatment before planting.

Translocation of Phytoplasma in Plants

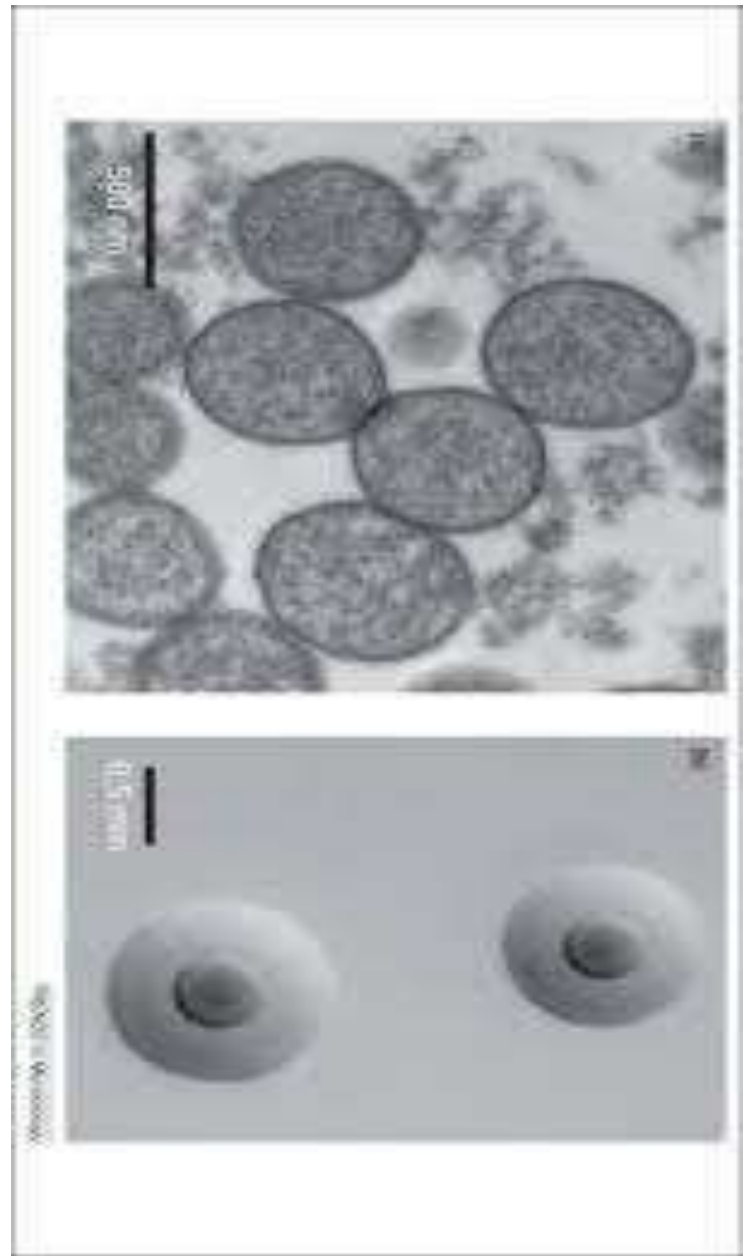
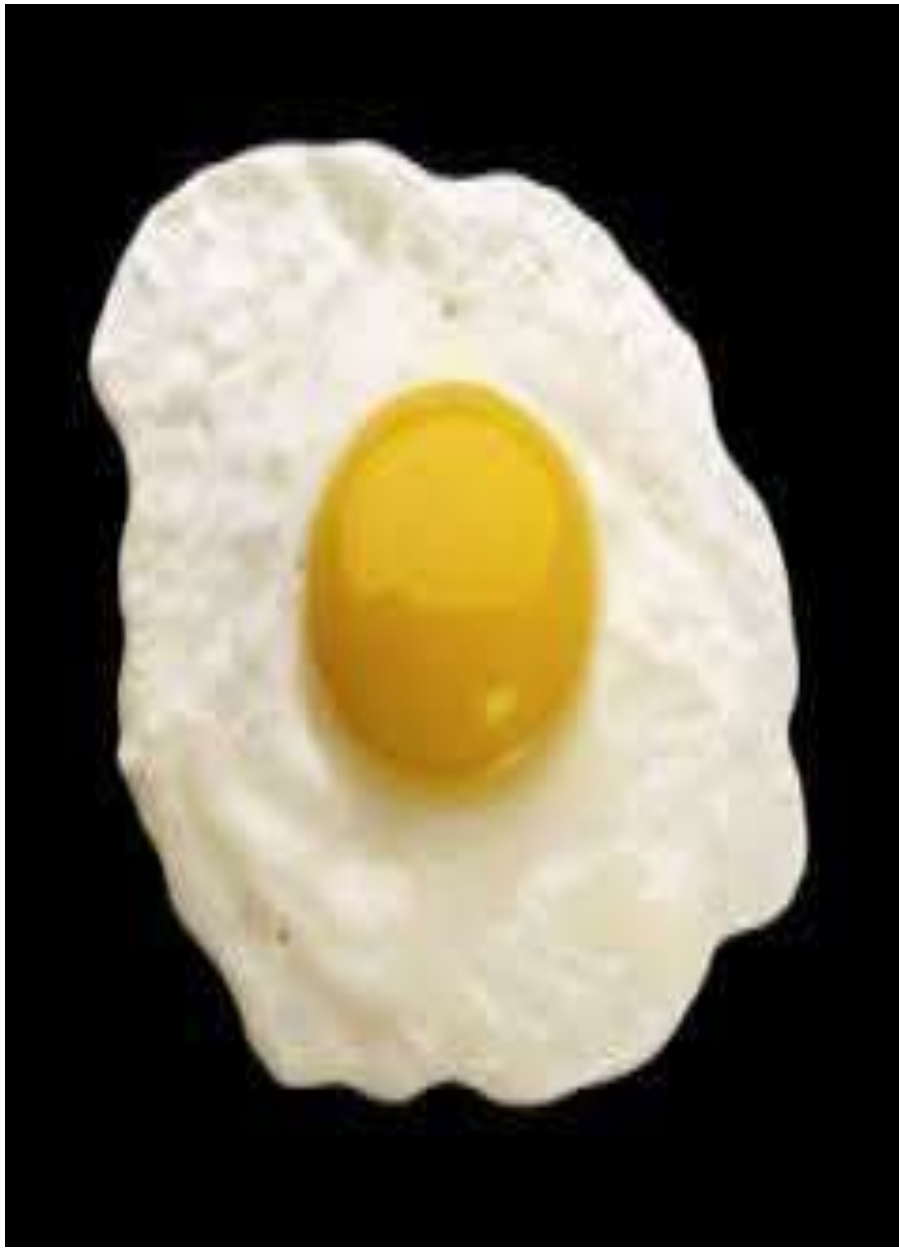
- **Phytoplasmas enter in to sieve tubes through insect transmission and moves throughout the plant body *via* phloem along with the cell sap**
- **They are very poorly distributed in the roots as compared to stem tissues**
- **Highest Phytoplasma concentration is found in the mature leaves**

SPIROPLAS

MA

DEFINTION

Spiroplasma is a genus of Mollicutes, a group of small bacteria without cell walls. **Spiroplasma** shares the simple metabolic parasitic lifestyle and fried-colony morphology and, small genome of other Mollicutes, but has a distinctive helical morphology, unlike Mycoplasma.



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SPIROPLAS

General Characters

MA

1. Spiroplasma are helical, prokaryotic microorganisms associated with a few diseases in plants
2. These organisms lack true cell wall
3. The cell is surrounded by a triple-layered unit membrane
4. They are culturable phytopathogens forming 'fried egg' type of colonies similar to mycoplasmas
5. The cell of *Spiroplasma* can vary in shape. They may be spherical, slightly ovoid or helical
6. Spiroplasma show rapid rotary or screw motion

SPIROPLAS

MA

7. There are no flagella present in these organisms
8. Spiroplasmas require sterols for their growth on culture media
9. Spiroplasmas are resistant to penicillin
10. They are sensitive to tetracyclines
11. Spiroplasmas can be transmitted by insects, dodder and grafting
12. The cell contains both DNA and RNA

Diseases caused by **Spiroplasma**

- The diseases caused by Spiroplasma are as follow:
- Citrus stubborn (*Spiroplasma citri*).
- Leaf roll
- Yellow dwarf of rice.
- Pear decline.
- Corn stunt (*Spiroplasma kunkelii*)
- Periwinkle yellows (Spiroplasma phoeniceum)



Citrus

- Present in the phloem
- Transmitted by several leafhoppers including *Circulifer tenellus*
- Causative agent *Spiroplasma citri*
- **SYMPTOMS**
- Different shapes of fruits
- Effect on colour

Control

The most effective way to prevent citrus stubborn preventdisease is *citr* to *Spiroplasma* infectin ydun susceptible g g,m planting and



Symptoms

Leaf tissue between the veins turns deep red to purple, with downward curling or cupping of the leaf margins.

Grapevine Leafroll-
Associated Viruses (GLRaVs)

Control

There is no chemical control for grape leafroll disease

Grape leafroll



Corn stunt
(*Siroplasma*)

List of symptoms/signs

Inflorescence - discoloration
panicle Inflorescence - twisting
and distortion

Leaves - abnormal
colours Leaves -
abnormal forms

Leaves - necrotic areas

Leaves - yellowed or
dead Stems - witches

broom Whole plant -
dwarfing

Control

Management of volunteer plants
during the off-season by removing
infected plants or discing will reduce
potential sources of inoculum.

Comparison of important characteristic of different prokaryotic microorganisms

	Character	Bacteria	Mycoplasma	Spiroplasma	Phytoplasma
1.	Cell structure	Prokaryotic	Prokaryotic	Prokaryotic	Prokaryotic
2.	Cell shape	Rod, spherical, spiral, comma, etc.	Ovoid, coccoid, filamentous	Spiral/helical ovoid	Generally spherical
3.	Cell size	0.5 μm – 20 μm	300 – 2000 nm	100 – 240 nm diameter and 1-2 μm long	200 – 800 nm
4.	Cell wall	(+)	(-)	(-)	(-)
5.	Plasma membrane	Lipo-protein triple-layered	Lipo-protein triple-layered	Lipo-protein triple-layered	Lipo-protein triple-layered
6.	Cultivability	(+)	(+)	(+)	(-)
7.	Sterol requirement	(-)	(+)	(+)	(-)
8.	Genome size	140 – 1300 Kb	580 – 2320 Kb	940 – 2220 Kb	530 – 1350 Kb
9.	Plasmid	(+)	(-)	(-)	(+)
10.	G+C Ratio	28–80	24–41	25–26	23–29
11.	Penicillin sensitivity	(+)	(-)	(-)	(-)
12.	Tetracycline sensitivity	(+)	(+)	(+)	(+)
13.	Host range	Plants, animals, human beings	Animals, human beings	Plants	Plants

Thank you

