Salahaddin University \Erbil
College of Agriculture
Plant protection Department
4th class

Plant Bacterial Diseases\Practical
5th lecture
Xanthomonas.

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Outline

- ✓ Introduction about ***Xanthomonas***.
- ✓ ***Xanthomonas*** species
- ✓ Morphology and growth
- ✓ Microscopic appearance
- ✓ Biochemical and physiological test .
- ✓ Diseases caused by ***Xanthomonas***.

Xanthomonas

- ***Xanthomonas*** is a genus of Proteobacteria, many of which cause plant diseases.
- There are at least 27 plant associated *Xanthomonas spp.*, that all together infect at least 400 plant species.
- Different species typically have specific host and/or tissue range and colonization strategies.

Taxonomy

- **Domain** : bacteria
- **Phylum:** Proteobacteria
- **Class:** Gammaproteobacteria
- **Order:** Xanthomonadales
- **Family**: Xanthomonadaceae
- **Genus**: *Xanthomonas*
- **Species**: *X. sp.*
- **Subspecies**: *X. spp.*

Some common species of *Xanthomonas*

- ***Xanthomonas alfalfae*** *:* bacterial leaf spot on Alfafa
- ***X. arboricola****:* cause diseases in trees like prunes , hazelnut, and walnut.
- ***X. axonopodis, X. citri :*** citrus canker
- ***X. campestris****:* verity of plant disease e.g. black rot of crucifers.
- ***X. cucurbitae*** *:* cause pumpkin spot
- ***X. oryzae****:* cause bacterial blight of rice
- ***X. phaseoli****:* bacterial blight of beans
- ***X. vasicola****:* bacterial leaf streak of corn (maize)

Morphology and growth

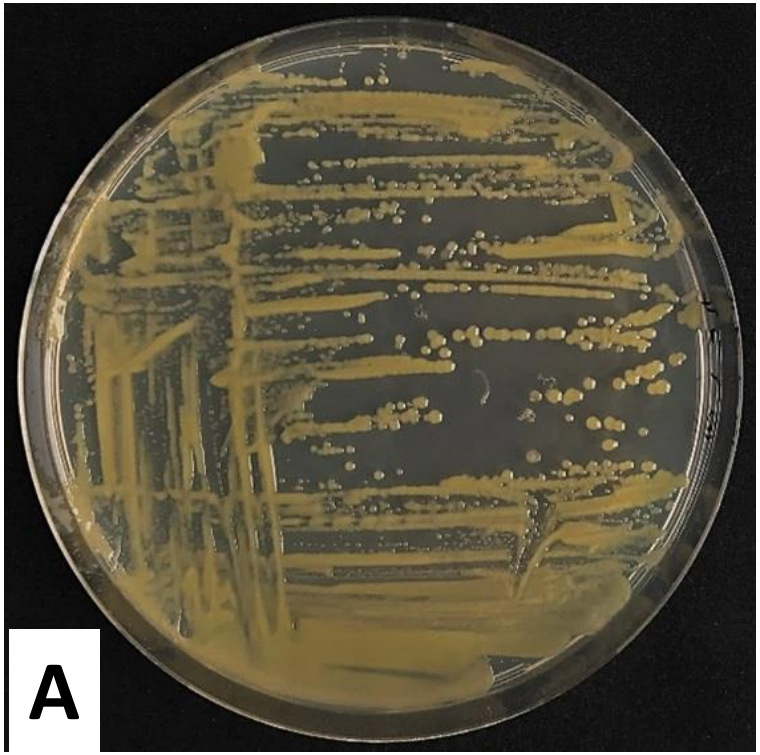
Individual cell characteristics include:

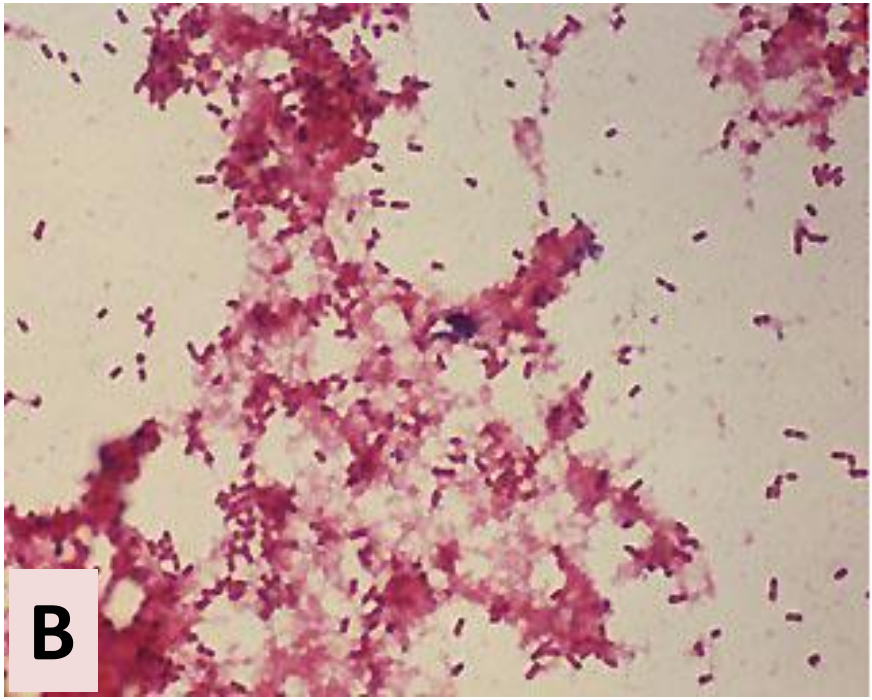
- **Cell type** –Single rods
- **Size** – 0.4 – 1.0 µm wide by 1.2 – 3.0 µm long
- **Motility** – motile by a single polar flagellum

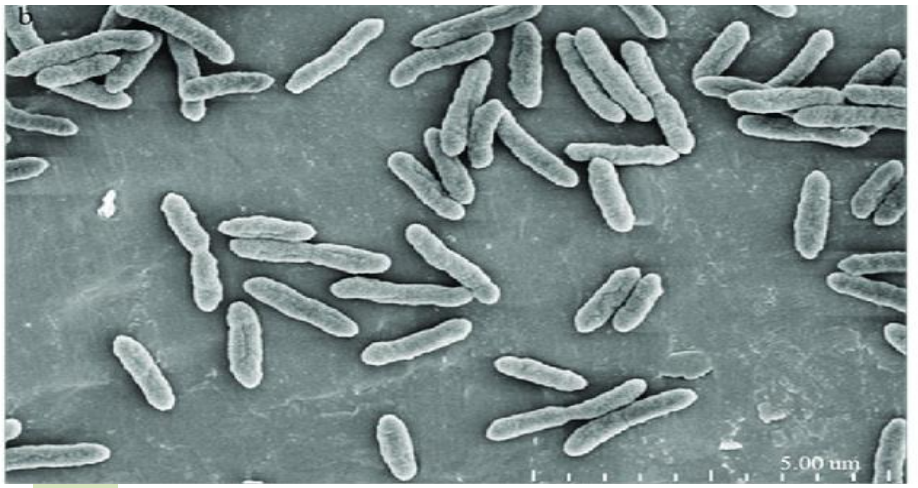
Colony growth characteristics include:

- **Pigmentation Colony shape**: Mucoid, and yellow colonies(Yellow pigment) on yeast dextrose calcium carbonate (YDC) medium.
- **Elevation** : convex.
- **Colony shape** : Filliform .
- **Margin** : Entire margin.
- Most produce large amounts of extracellular polysaccharide.
- **Temperature range** (– 4 to 37°C)
- **Optimal growth** 25-30 °C.
- Most species grow slowly.
- All species are plant pathogenic, found in association with plant or plant materials.

Colony growth characteristics







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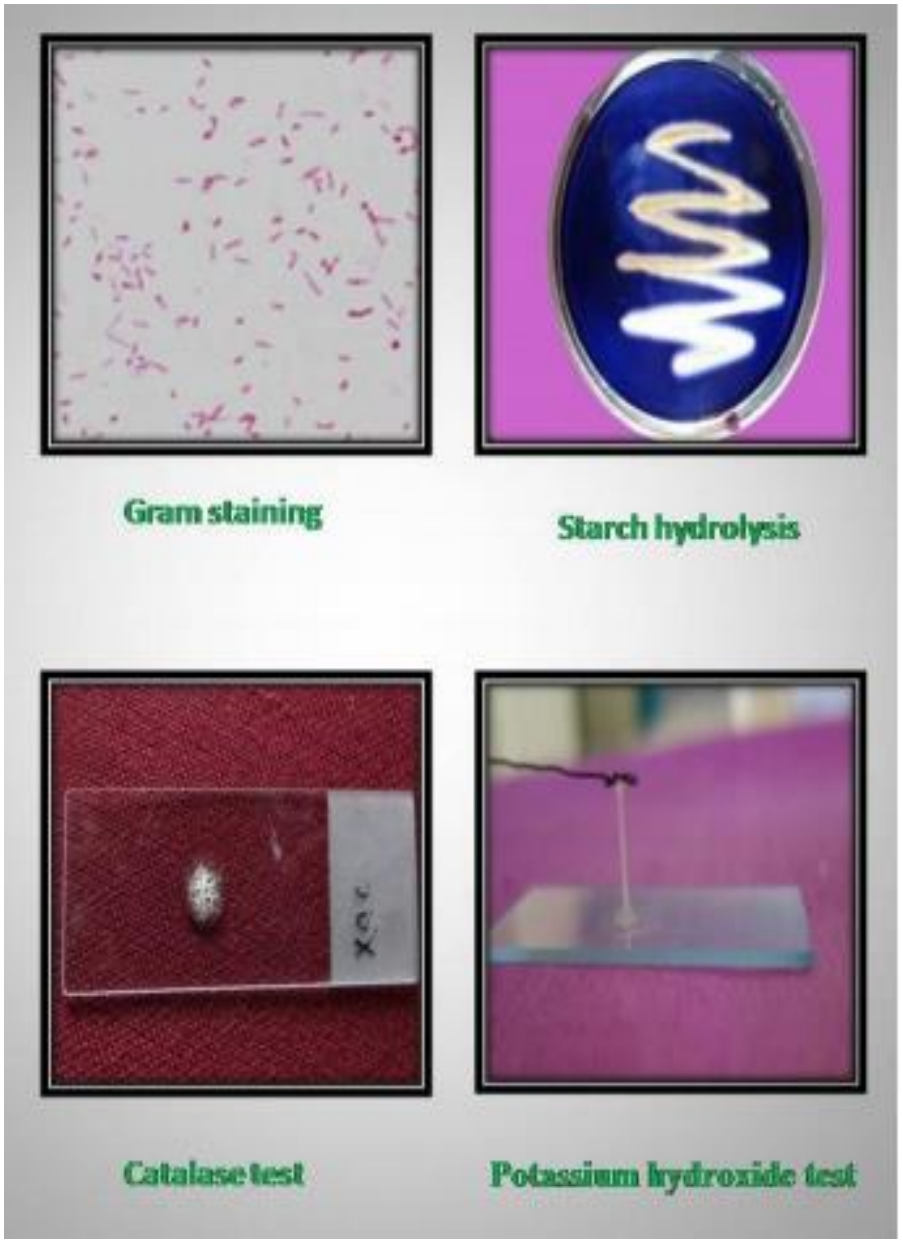
A) Colony of Xantomonas sp on YDC medium
B) ***Xanthomonas*** **Gram-negative**
C) Electron microscope view of ***Xanthomonas*** cells

Biochemical and physiological test

- **Obligate** : aerobes
- **Catalase**: positive
- **Oxidase**: negative
- **Starch hydrolysis**: positive
- **KOH test:** positive



Diseases caused by ***Xanthomonas spp***

1-Citrus canker:

Pathogen : *Xanthomonas campestis pv. citri*

- The disease causes necrotic dieback
- General tree decline.
- Premature fruit drop and fruit blemishes.
- Severely infected trees become weak, unproductive and unprofitable.

Different symptoms of Citrus canker

Diseases caused by ***Xanthomonas spp***

2-Bacterial blight of pomegranate:

Pathogen: *Xanthomonas axonopodis pv. punicae*

- Initially, spots are black and round which are surrounded by bacterial ooz.
- Under favorable conditions, spots enlarge to become raised, dark brown lesions with indefinite margins that cause the fruit crack.
- The disease may cause up to 90% yield reduction.

Bacterial blight symptoms of pomegranate

Diseases caused by ***Xanthomonas spp***

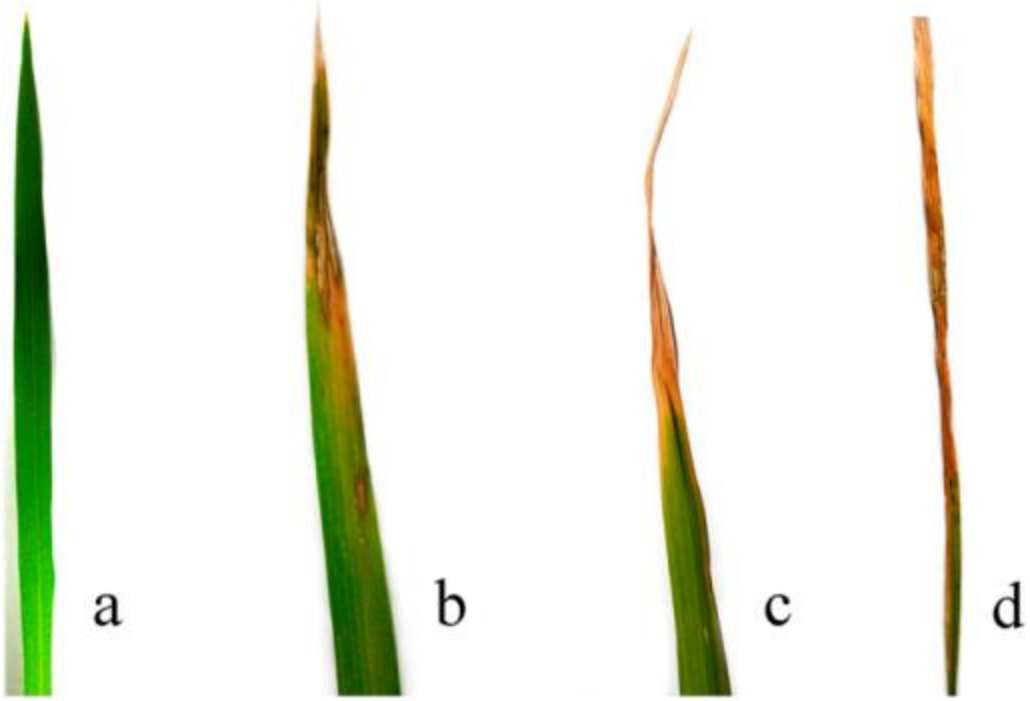
3-Bacterial leaf blight of rice:

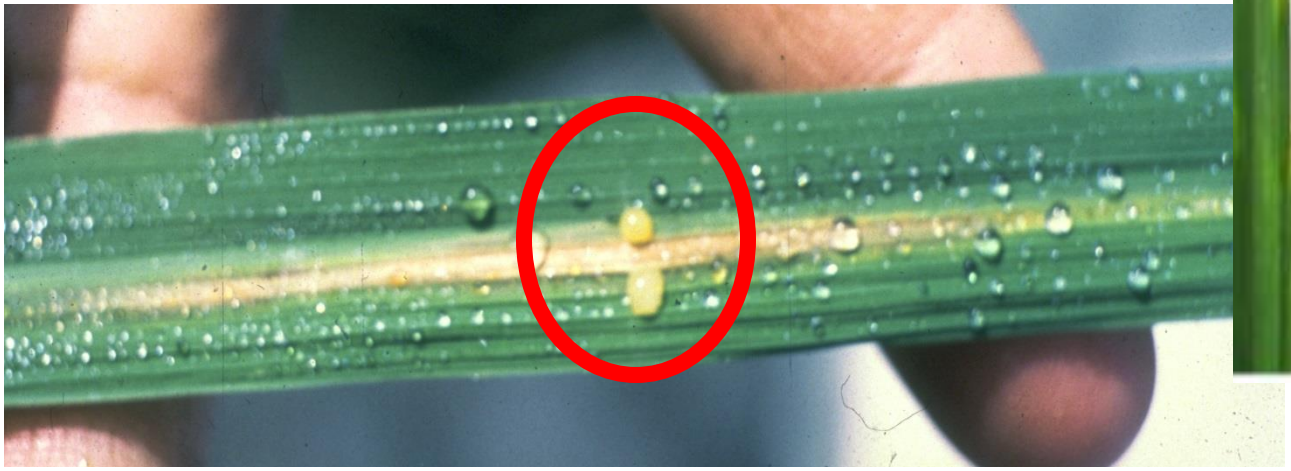
Causal agent : *Xanthomonas oryzae pv. Oryzae*

Symptoms:

- On seedling, the infection appears tiny water soaked spot at the margin on the leaves.
- On leaf blade, the infection begins at the margin as water soaked stripe.
- Resulting in the wavy margin and yellow leaf within few days.
- A turbid ooze of the bacterium, streaming from the vascular can be observed on dipping the cut end of affected leaves in clear water.
- the lesions can cover the whole blade, turn white and later grayish contaminated with various saprophytic fungi.

Symptoms of Bacterial leaf blight of rice





Diseases caused by ***Xanthomonas spp***

4-Bacterial leaf streak of rice :

Pathogen : Xanthomonas campestris pv. Oryzicola

Symptoms:

- ❖Fine translucent streaks appear between the veins of the leaf are the first symptoms.
- ❖The lesions enlarge lengthwise and advance over larger veins laterally and turn brown.

Symptoms of Bacterial leaf streak of rice

Diseases caused by ***Xanthomonas spp***

5-Bacterial spot of tomato:

Causal agent: *Xanthomonas campestris pv. versicatoria*

Symptoms:

- Initial leaf symptoms are small , circular-to –irregular, dark lesions, which may be surrounded by a yellow halo.
- The lesions tend to concentrate on the leaf edges and tip and may increase in size to a diameter of 3-5 mm.
- Infected leaves may develop a scorched appearance,
- When spots are numerous ,foliage turns yellow and eventually dies.

Symptoms of Bacterial spot on tomato

Diseases caused by ***Xanthomonas spp***

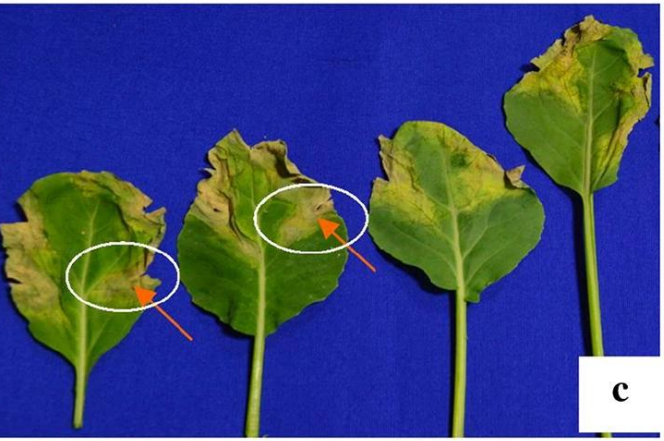
6-Black rot of crucifer:

Pathogen: *Xanthomonas campestris pv. campestris*

Symptoms :

- It is seed borne disease by which cauliflower is affected both in nursery and in field.
- The plant may be affected at any stage during its growth.
- Infected leaves show yellowing at margins and the necrosis towards the center of the leaf, forming V-shaped area .
- The veins become brown or dark and vascular regions of the main stem discolored.
- Leaves fall prematurely due to formation of abscission layer.

Symptoms of Black rot of crucifer



Samples of different cabbage plant infested with *X. campestris* pv. *campestris*