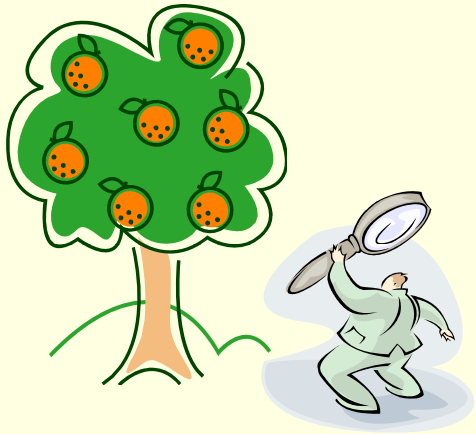
PATHOLOGY TRAINING

Citrus

Health

Response

Program



CITRUS HEALTH RESPONSE PROGRAM
PROTECTING FROM ROOT TO FRUIT

Objectives:

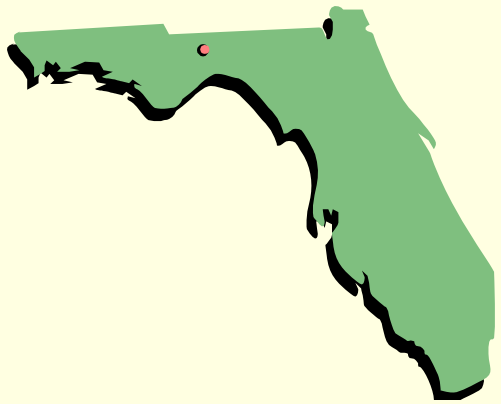
- 1. To learn about Citrus Canker
  - A. Identifying citrus canker leaf suspects.
  - B. Identifying citrus canker fruit suspects.
- 2. To compare Citrus Canker with other Citrus Diseases

Serrano/USDA

PART I.- CITRUS CANKER

Citrus canker

- Citrus and citrus canker are originally from southeast Asia.
- Caused by *Xanthomonas axonopodis* pv. *citri* (*Xac*), a bacterium
  - Most plant diseases are caused by fungi
- The Asiatic form, or A-strain, is the most widespread and severe form.
  - A-strain found in Florida.



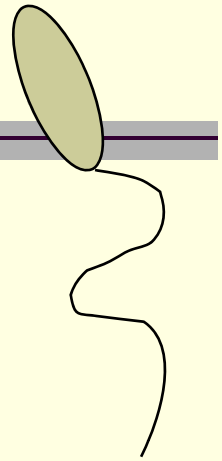
History of Citrus Canker in Florida

- 1910 – Canker identified in Florida for first time.
- 1933 – Canker eradicated.

- 1986 – New detection in Manatee County 53 years later.
- 1994 – Eradication declared.

- 1995 – Canker detected for a third time near Miami International Airport.

Plant Pathogenic Bacteria



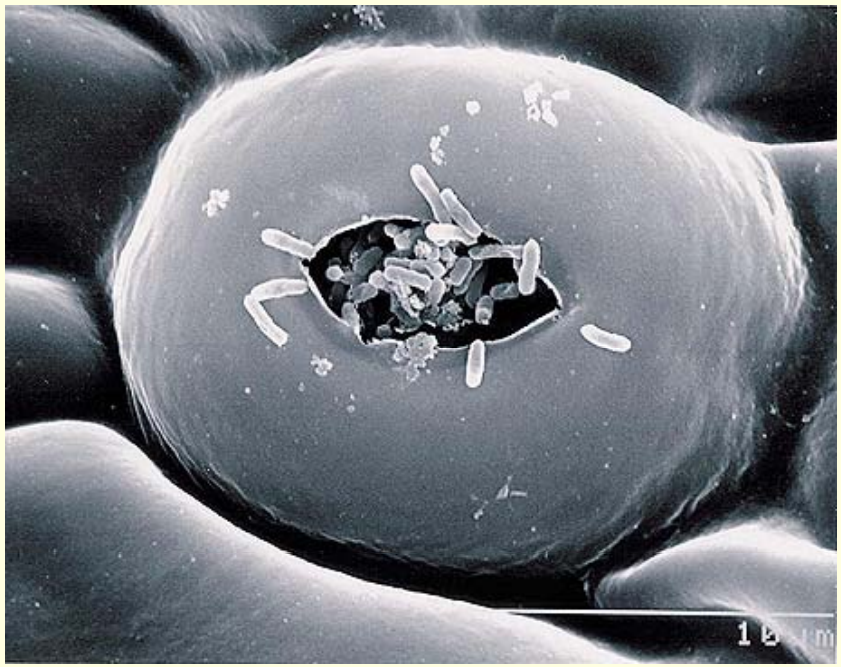
- One-celled organisms, mostly rod shaped.
- Human hair ~100μ wide, bacteria ~1-3μ.
- Reproduce by simple cell division.

  -One bacteria can become a million in as little as 10 hours!!!
- Not capable of direct penetration (fungi are.)
- Generally, not very durable in dry environs or direct sunlight.

Citrus Canker Bacteria
Xanthomonas axonopodis pv. citri

- Obligate aerobic, rod-shaped, with 1 flagella
- Is spread by

Stomates and natural openings serves as the primary way for the bacterium to gain access to host tissue.



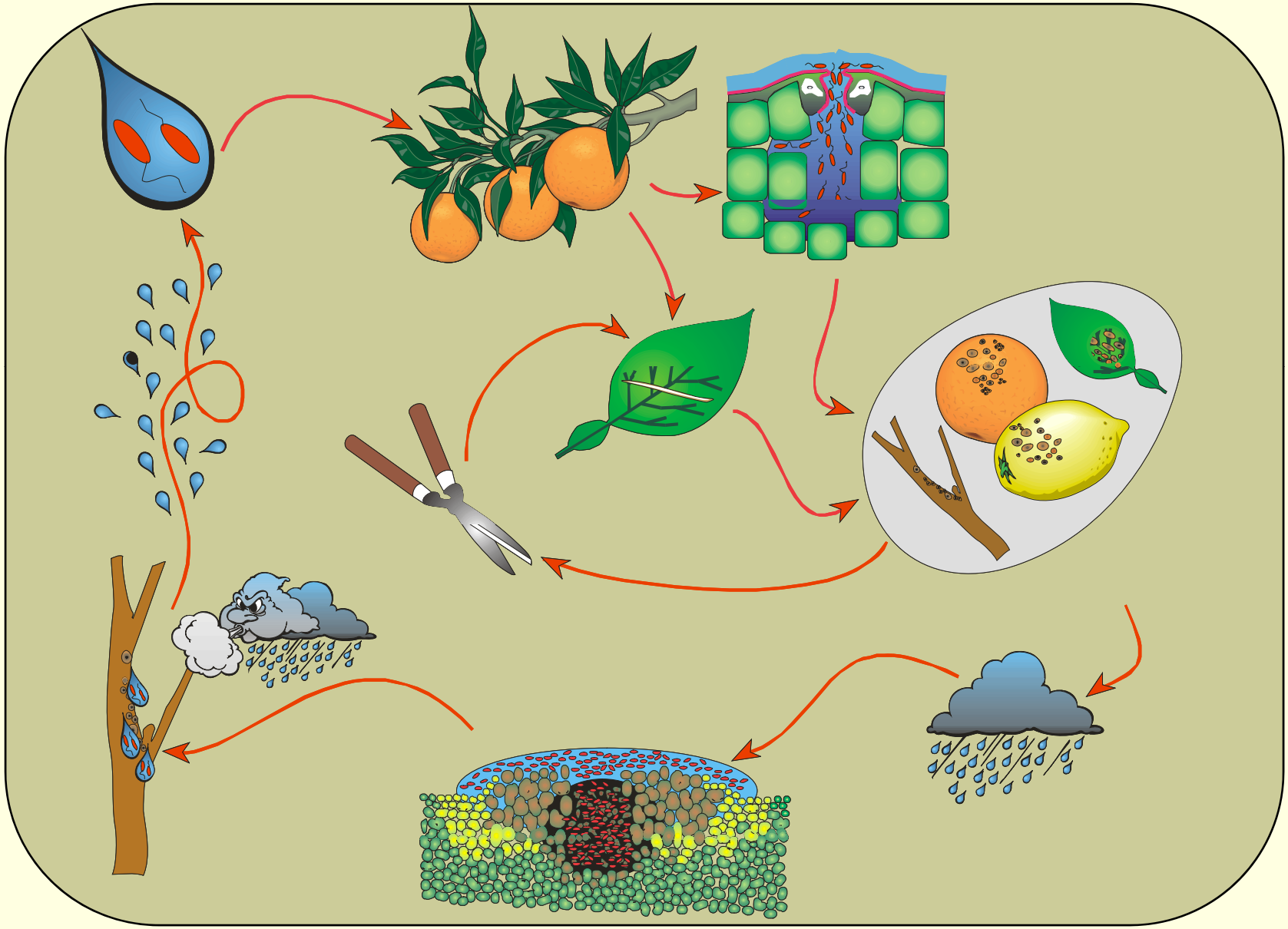
SEM of stomata on grapefruit leaf with *Xac* bacteria entering stomatal chamber

Citrus Canker Bacteria
Xanthomonas axonopodis pv. citri

- Obligate aerobic, rod-shaped, with 1 flagella
- Is spread by
  - Wind driven rain > 18mph
  - Moving diseased plants
  - Can enter wounded sites
  - Can be spread through casual contact
- Survives on inanimate surfaces for 24-48 hours.

DECONTAMINATE

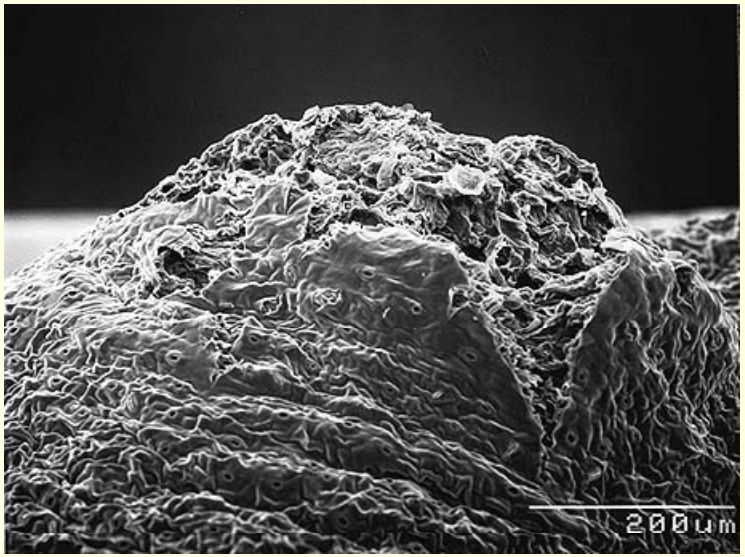
Citrus Canker Disease Cycle



Plant Disease Vol. 85, No. 4, 2001

Characteristics of Citrus Canker Foliar Lesions

- **Will be raised**
- **Will be on both sides of the leaf**



SEM of erumpent citrus canker lesion

Citrus Canker: The Pathogen and Its Impact

Characteristics of Citrus Canker Foliar Lesions

- Will be raised
- Will be on both sides of the leaf
- **Crater like appearance**
- **Concentric circles**

Characteristics of Citrus Canker Foliar Lesions

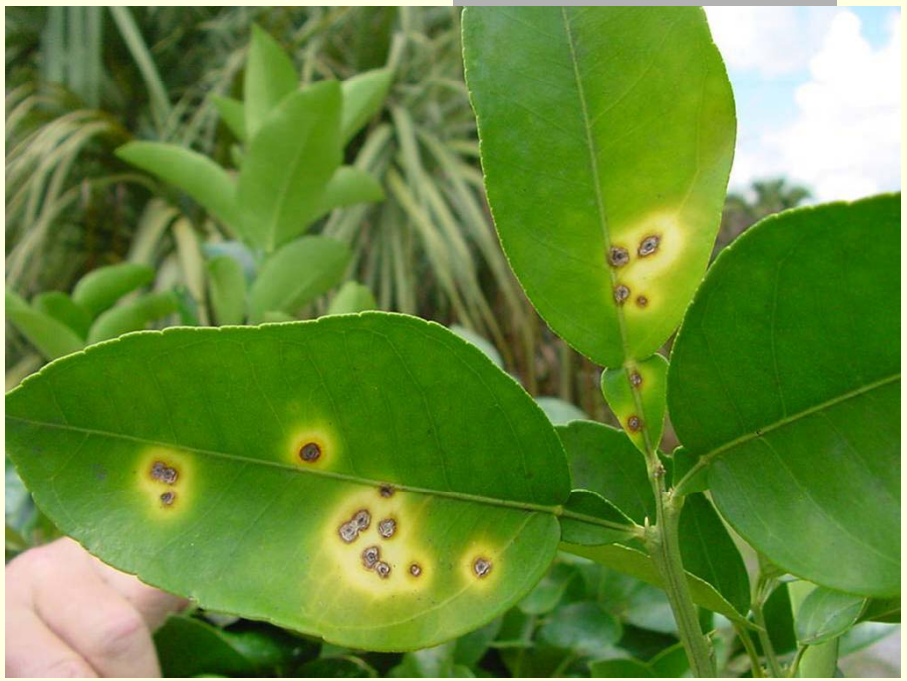
- Will be raised
- Will be on both sides of the leaf
- Crater like appearance
- Concentric circles
- **Corky texture**

Characteristics of Citrus Canker Foliar Lesions

- Will be raised
- Will be on both sides of the leaf
- Crater like appearance
- Concentric circles
- Corky texture
- **Water soaked margin**

Characteristics of Citrus Canker Foliar Lesions

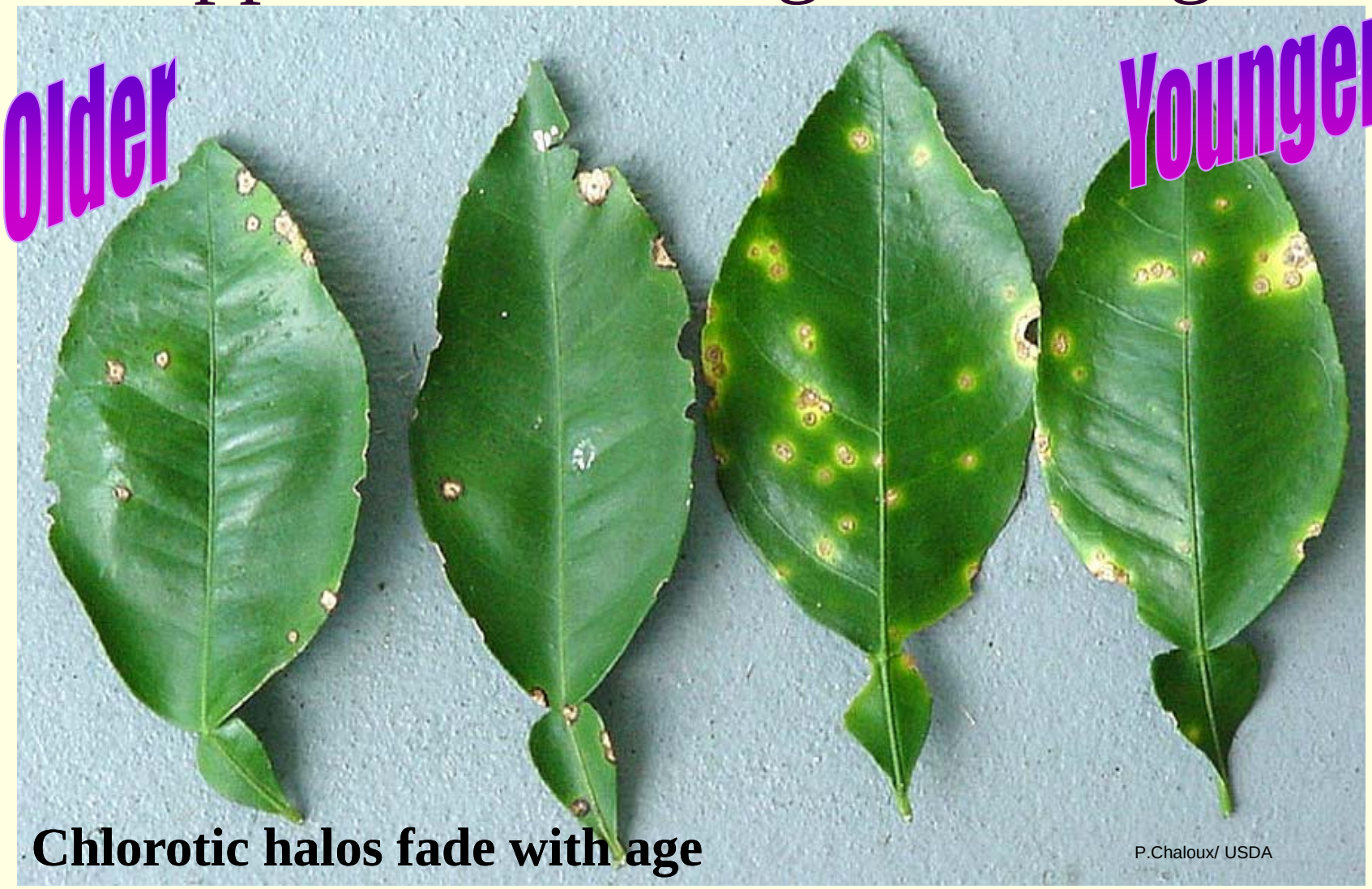
- Will be raised
- Will be on both sides of the leaf
- Crater like appearance
- Concentric circles
- Corky texture
- Water soaked margin
- **May have yellow halos**



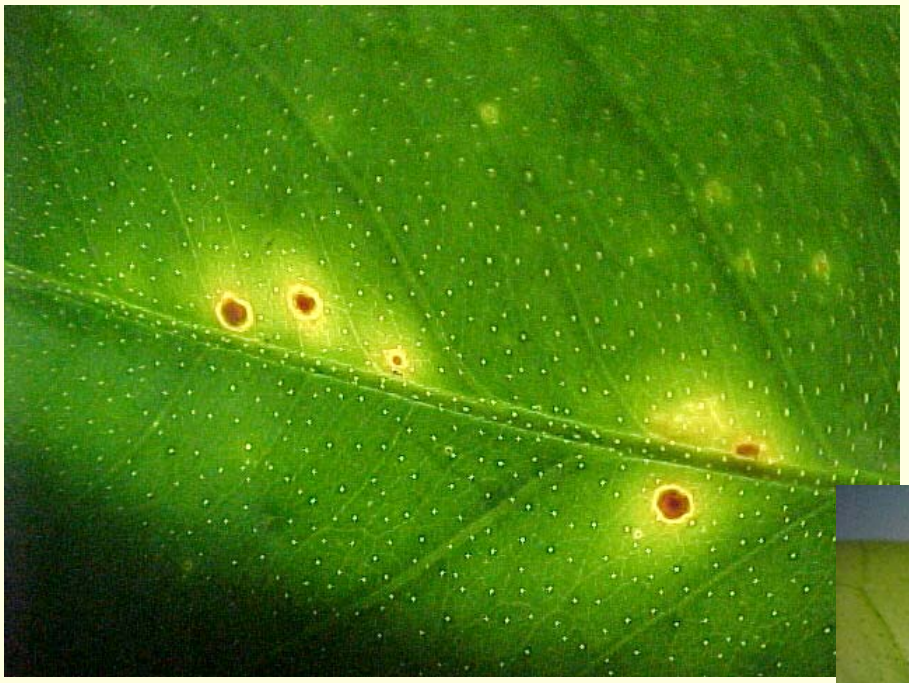
Characteristics of Citrus Canker Foliar Lesions

- Will be raised
- Will be on both sides of the leaf
- Crater like appearance
- Concentric circles
- Corky texture
- Wet margin
- May have yellow halos
- **May have shot holing**

Appearance Changes with Age



Very Young Lesions

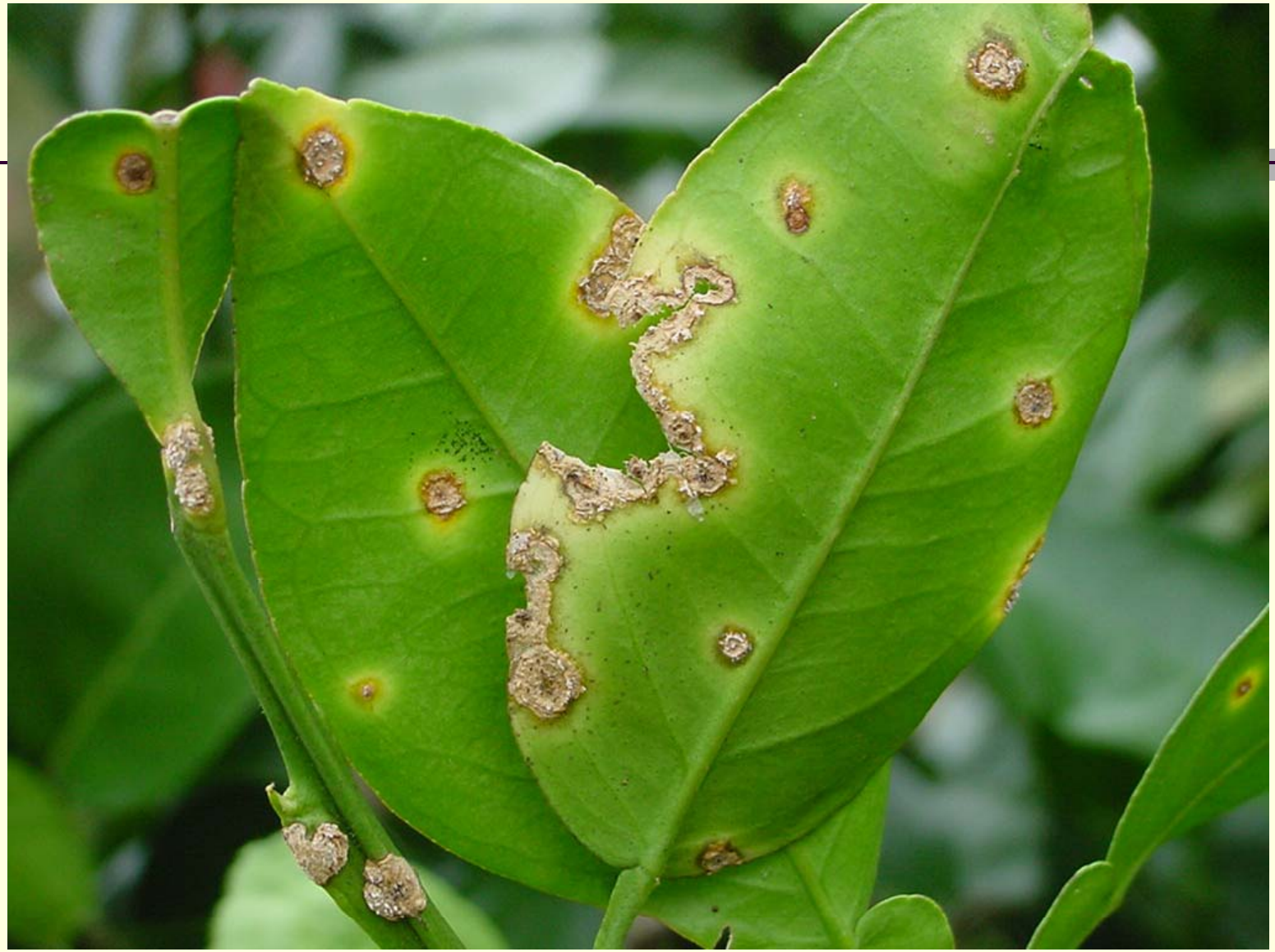


-Small lesions

-More noticeable on underside of leaf

-Often with very wet (looking) margin

3 – 6 month old lesions on Tahiti lime



6 - 9 month old lesions on Grapefruit

Older Canker Lesions

Sometime you may see saprophytic fungi (white fuzz) and fruiting bodies (black dots) growing on older lesions.

Lesion appearance also changes with variety

GRAPEFRUIT

GRAPEFRUIT

KEY LIME

KEY LIME

SWEET ORANGE

SWEET ORANGE

TANGERINE

TANGERINE

Looking for Canker leaf lesions in the grove

Backlit Lesions

Looking for Canker leaf lesions in the grove

Canker lesions may be found in leaf miner wounds

Looking for Canker leaf lesions in the grove

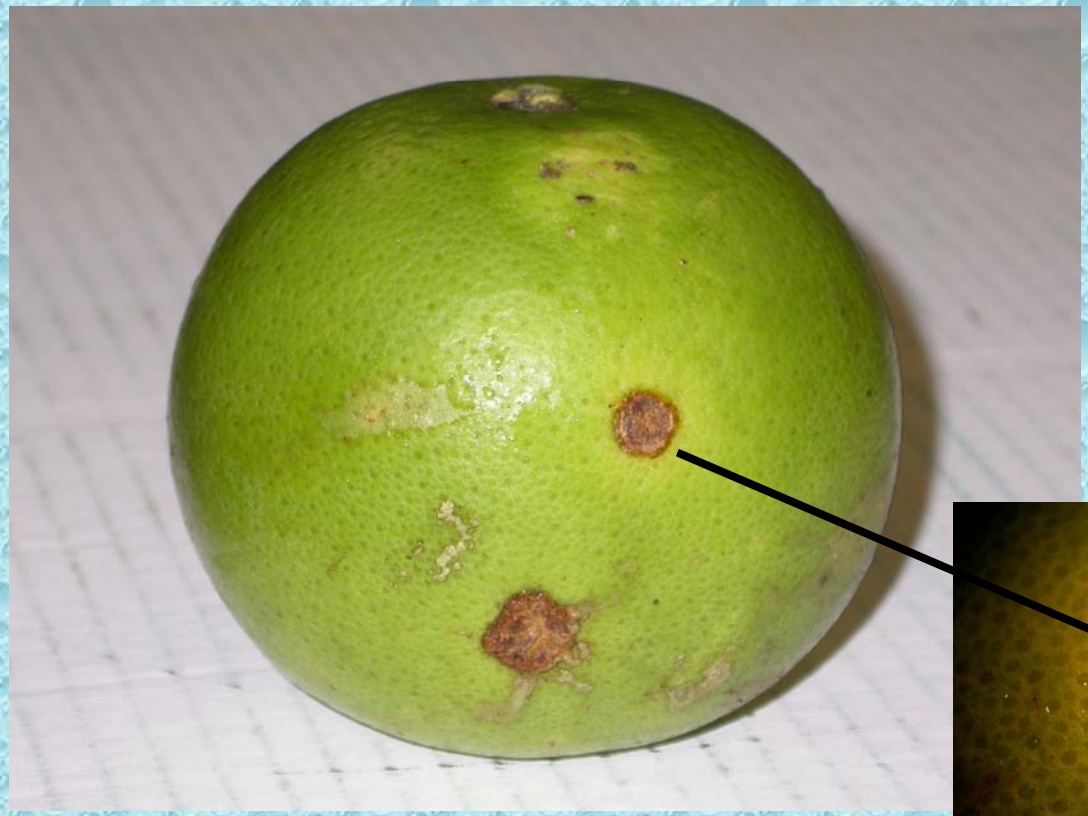
Other wounds

Looking for Canker leaf lesions in the grove

New Growth – but don’t ignore the Old growth.

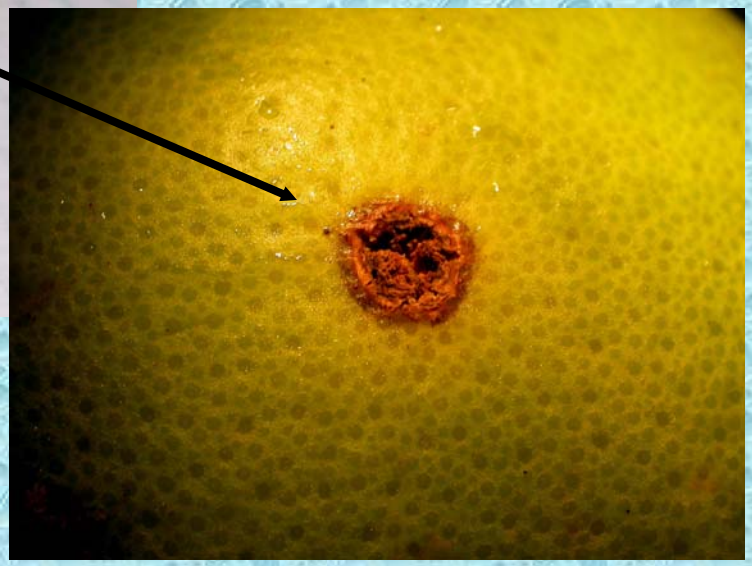
Stem Lesions

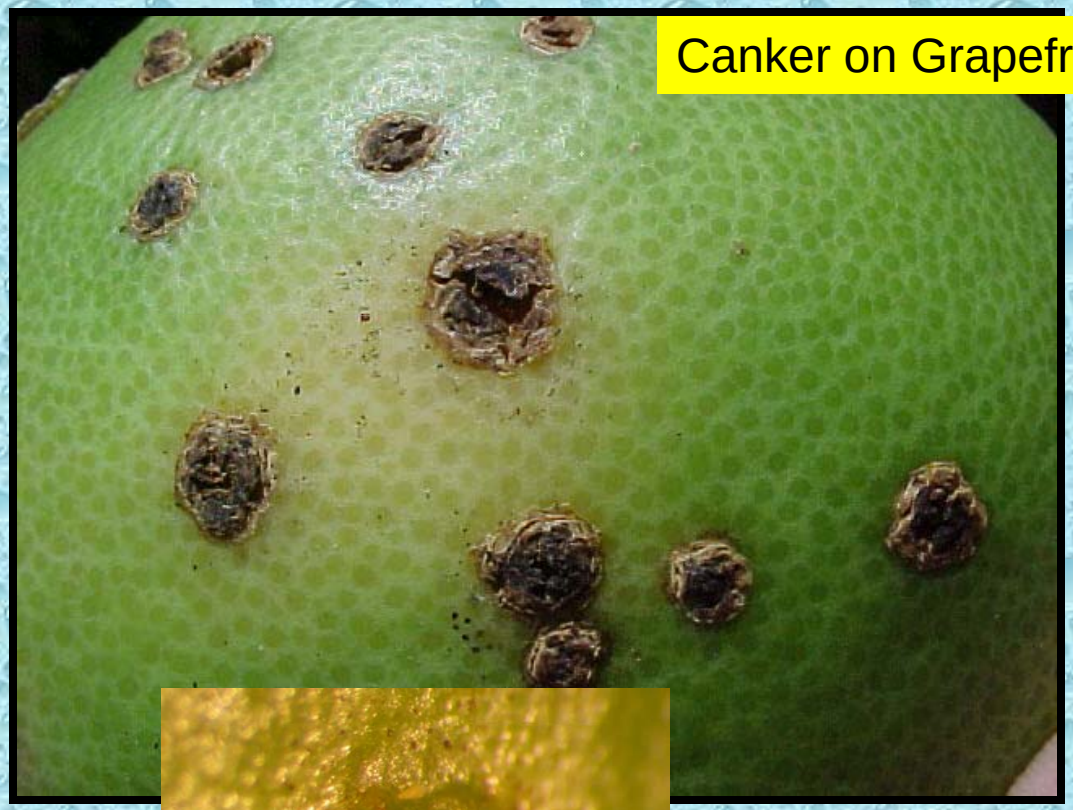
Characteristics of Citrus Canker Fruit Lesions



GRAPEFRUIT

- Raised
- Concentric circles and relatively circular in appearance





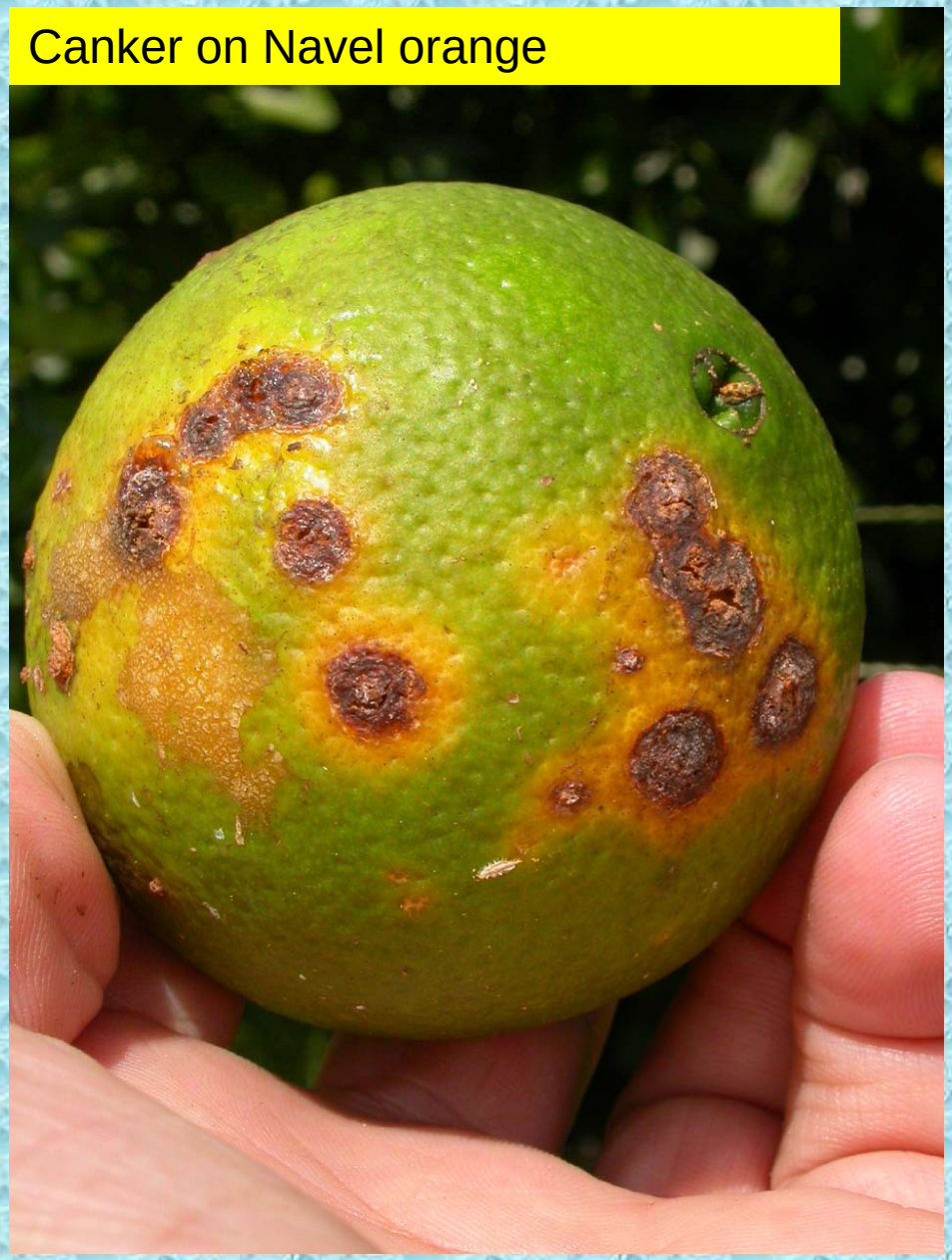
Canker on Grapefruit

Close-up of lesion

- Raised
- Concentric circles and relatively circular in appearance
- Cracking of lesion
- May have a wet margin

Close-up of Canker lesion on Grapefruit

Canker on Navel orange



- Always Raised
- Concentric circles and relatively circular in appearance
- Cracking of lesion
- May have a wet margin
- May have yellow halo

Canker on Sweet orange

Valencia Orange

Characteristics of Citrus Canker Fruit Lesions

TANGERINE

Characteristics of Citrus Canker Fruit Lesions

KEY LIME

Collecting and Submitting Canker Specimens

- Collection
  - Collect 4-7 symptomatic leaves per tree.
  - Place leaves inside labeled bag. Spray outside of bag with decontaminate.
  - Place sample in second bag. Label the bag as CANKER.
  - Keep bag in a cool place.
  - Send the sample overnight to the Lab
    - (do not send samples on Friday)

PART II.- Other Diseases

Greasy Spot

Melanose

Scab

Alternaria

Key Lime Anthracnose

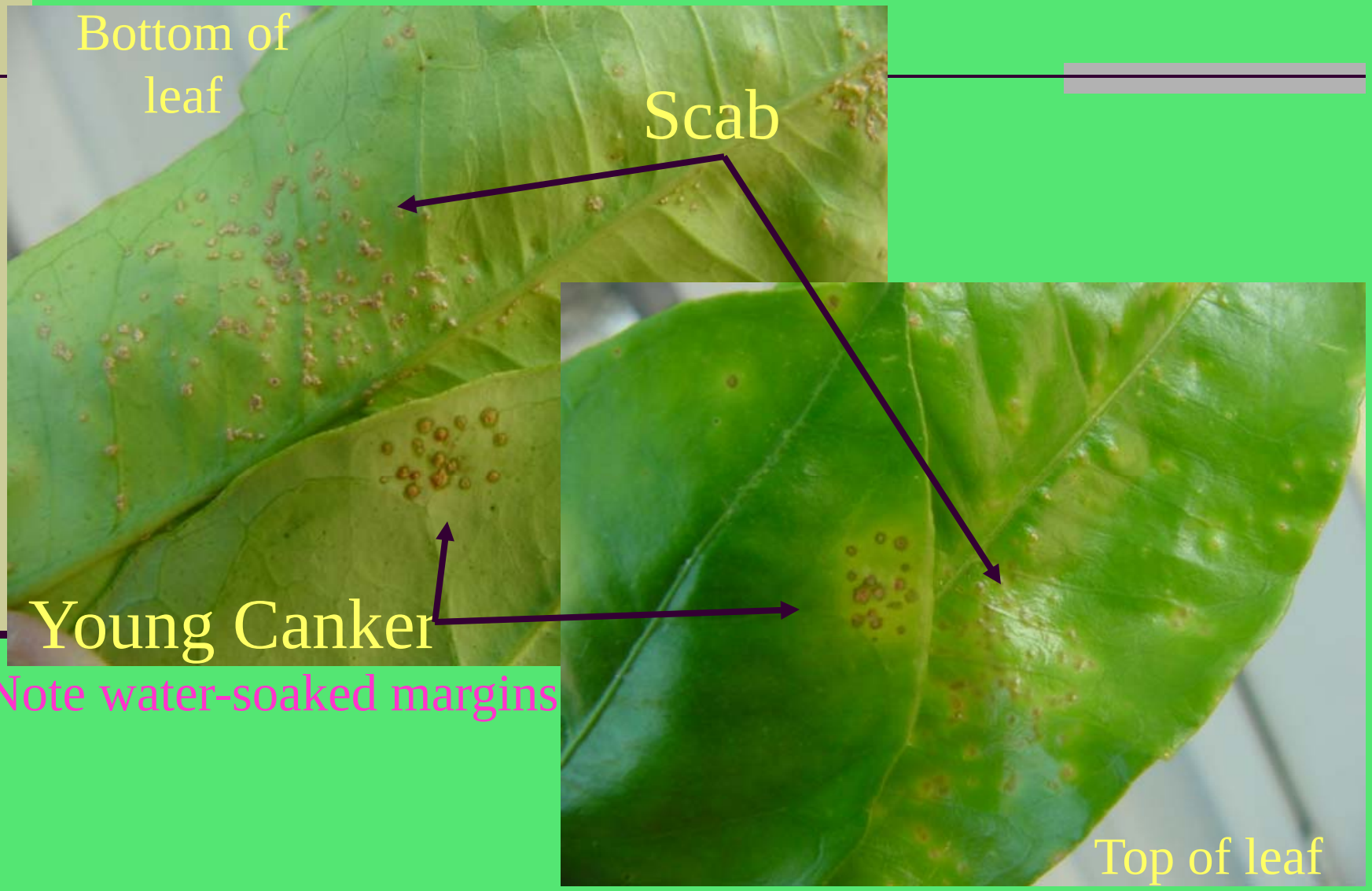
Citrus Scab

Elsinoe fawcetti

Citrus Scab vs Citrus Canker on Leaves

- **SCAB**
- **CANKER**

Scab vs. Young Canker



Citrus Scab vs Citrus Canker on Fruit

- **SCAB**
- **CANKER**

Scab and canker on Grapefruit

Greasy Spot

Mycosphaerella citri

Greasy Spot vs Canker on leaves

Greasy Spot

Canker

Melanose

Diaporthe citri

Melanose vs Canker on leaves

Melanose

Canker

Melanose
Diaporthe citri




Melanose vs Canker on fruit

Melanose

Canker

Anthracnose

Colletotrichum gloeosporoides

Anthracnose vs citrus canker on leaves

Anthracnose

Canker

Anthracnose vs citrus canker on fruit

Anthracnose

Canker

Alternaria

Alternaria alternata pv. *citri*

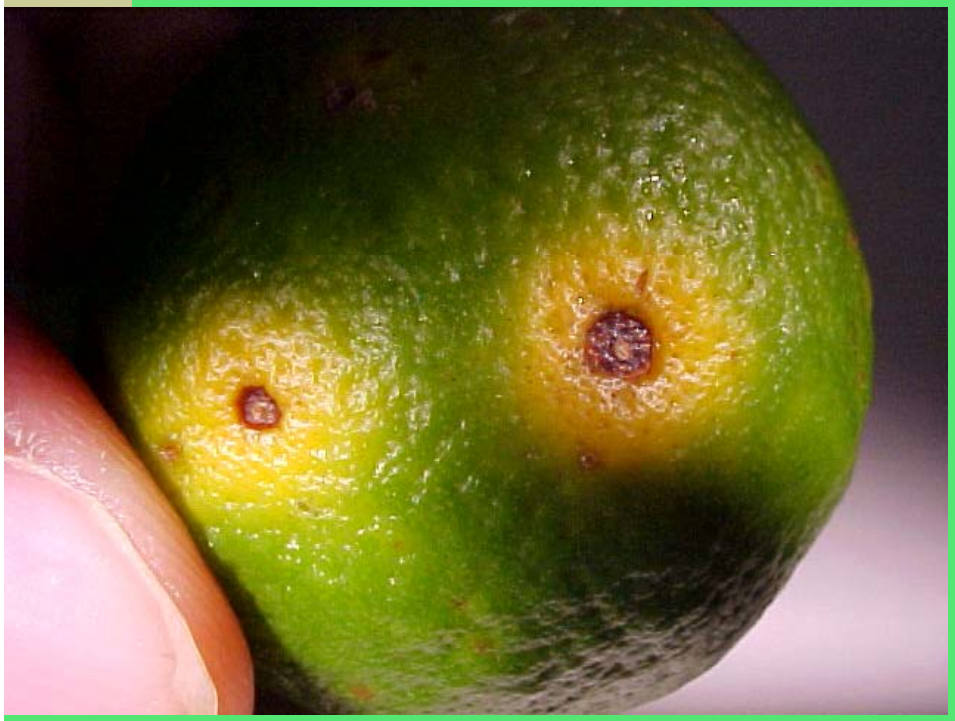
Alternaria vs citrus canker on leaves

Alternaria

Canker

Alternaria on Honeybell Tangelo

Alternaria vs citrus canker on fruit



Alternaria

Canker

Alternaria vs citrus canker on fruit

Alternaria

Canker

Identification Flowchart for Common Foliar Diseases of Citrus

7-31-2002

Do individual lesions appear on one or both sides of the leaf?

One side

Are the lesions light tan or red-brown to black in color?

Light tan

Red-brown to black

Citrus Scab

Melanose

Surface usually feels rough, like sandpaper

Both sides

Are the lesions raised or flat?

Flat

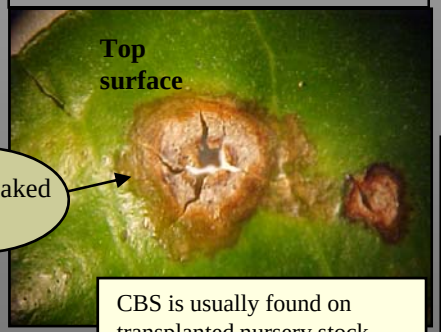
Raised

Is a water-soaked ring, and/or cracking of the lesion present?[1]

No

Yes

CBS (Citrus Bacterial Spot)



CBS is usually found on transplanted nursery stock that has been in the ground less than 2 years.

Are the lesions rough or smooth?

Rough

Citrus Canker

Smooth

Greasy Spot

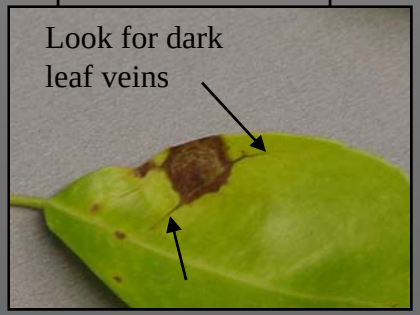
Are the lesions whitish or brown?

Whitish

Brown

Anthracnose

Alternaria



[1]Citrus canker bacteria also cause water-soaking to occur, but CBS usually produces a wider, more obvious ring. Also, Citrus canker lesions rarely have cracks in them.

This flowchart will help identify the proper disease about 80% of the time. Sometimes symptoms are unclear or confusing, especially if more than one disease is present. **When in doubt**, a pathologist should be consulted to give a definitive diagnosis.

Other Fruit Disorders

Surface Blemish ----

Surface Blemish ----

Other Fruit Disorders

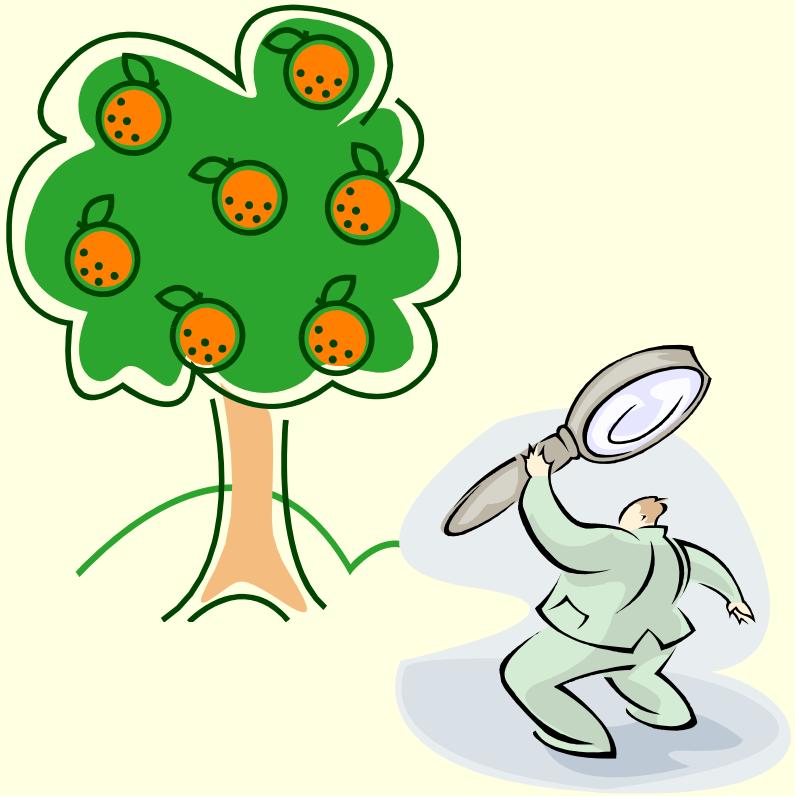
Mechanical Injury ----

Shallow Rind Injury ----

Other Fruit Disorders

Herbicide Overspray Injury ---

Bird Injury ----



THE END