Hands-on identification of vegetable diseases: Roses

Theme: How to diagnose a specific disease from diseases or disorders with similar symptoms.

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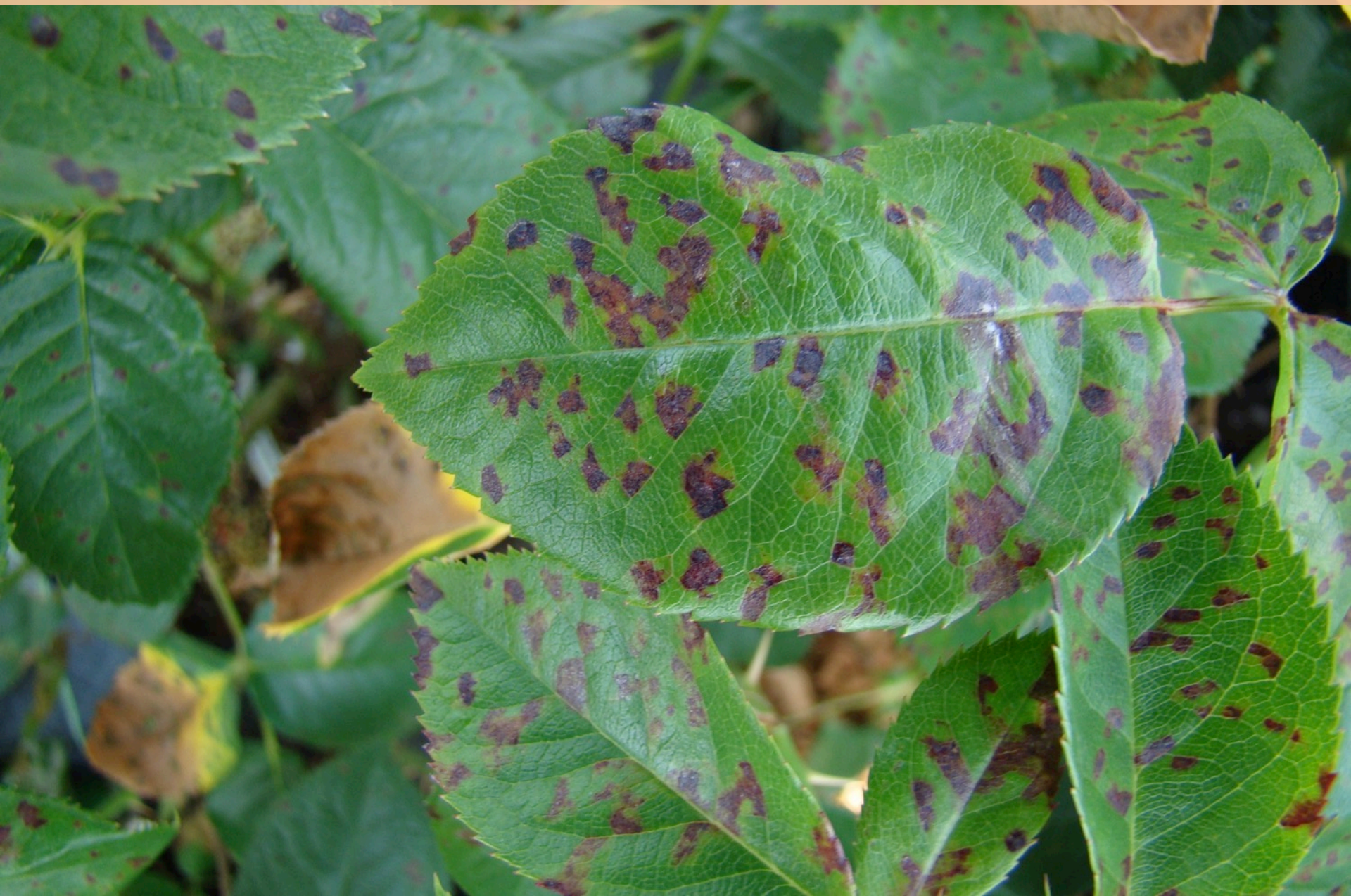
Diseases of relevance to Florida

- Downy mildew
- Black spot
- Cercospora leaf spot
- Botyritis
- Rose mosaic
- Crown gall

Downy mildew

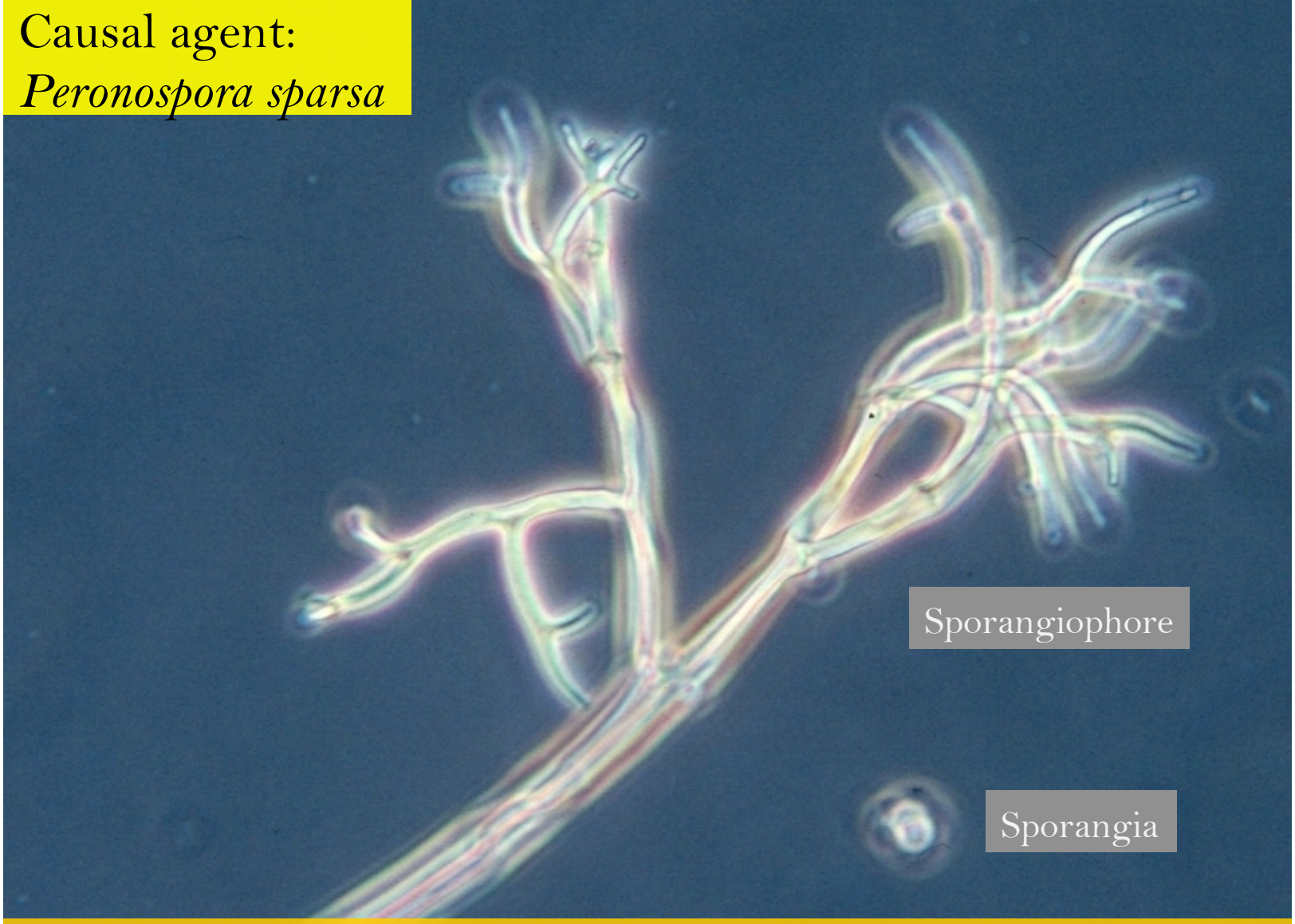
Downy mildew starts as small angular yellow spots on the leaves

The yellow spots will turns purple in color. In severe cases purplish patches can be seen on the stems, peduncle, calyxes, and petals.



Foliar symptom at later stages resembles like a spray burn. At the advanced stage of the infection brown dead areas can be seen within the purplish blotches. Leaflets may turn yellow. Leaf abscission may be severe.

Causal agent:
Peronospora sparsa



The Key point: Understanding the biology of the causal agent of downy mildew is highly relevant in initiating an effective IPM program

The biology and management options

- *P. sparsa* is more closely related to algae than fungi.
- Under humid, cool conditions, sporangiophores and sporangia appear on lower leaf surface, but under other conditions, spore production is sparse.
- Sporangia may be produced for long periods of time when high humidity and low temperature persist.

<85% humidity: no downy mildew

50-75°F: temperature for spore germination

41°F: no spore germination

81°F for 24 hrs: spores killed

- Sporangia germinate within 4 hours of leaf wetness, and sporulation may occur in 3 days under ideal conditions.
- Spores can survive for a month on dried, fallen leaves.

- **Management:** Space plants adequately, and regular thinning and pruning operations will help to avoid canopy overlap.
- Infected plant parts should be destroyed to avoid seasonal carryover of the organism.

- The mycelium are intercellular in host tissues. The organism may overwinter in stems as dormant mycelia without oospores.
- Oospores of the fungus are likely the primary overwintering inoculum.

- "Real fungi" do not produce spores that swim.
- On the other hand downy mildew produce zoospores that can swim in free water on plant surfaces. They can keep swimming until they find the host tissue.

- **Management:** Irrigation should be carefully monitored to prevent long duration of leaf wetness.

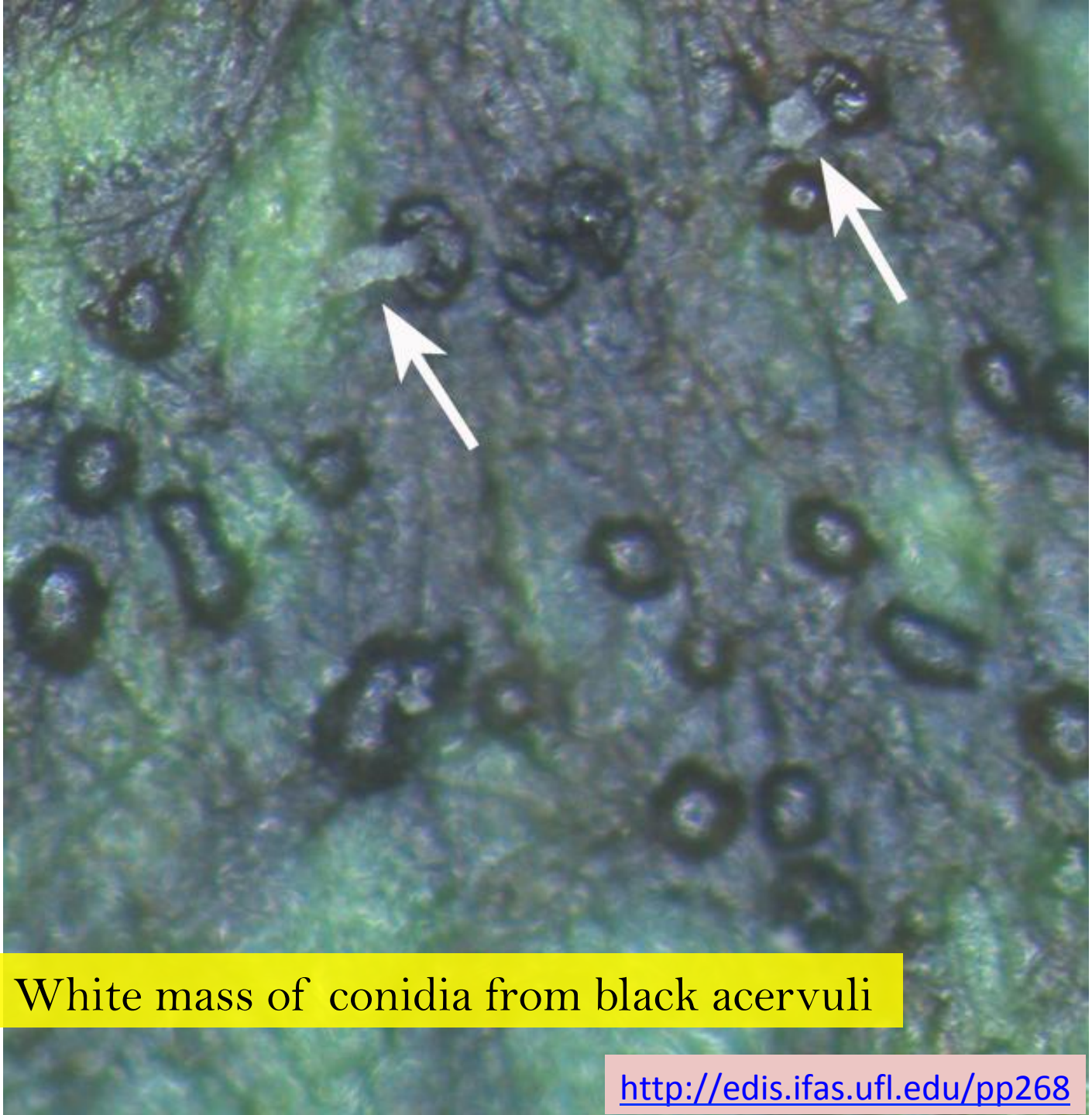
- **Preventative fungicide program :** >85% R.H. for more than 3 hours and cool weather conditions.
- **The key point: Do not wait to see downy mildew!.**

Black spot

Symptoms start as small black spots on the upper surface of the leaves. Lesions can vary in size on the leaf surfaces.

These spots may have unique feathery borders. Leaves turns yellow around the black spot lesions leading to severe defoliation. The defoliation usually starts on the lower leaves. Spots can be found on peduncles, fruits, and sepals if the infection is severe.

Black acervuli (spore bearing structures) can be noticed on the damaged leaves, and you may see mycelial growth.



White mass of conidia from black acervuli

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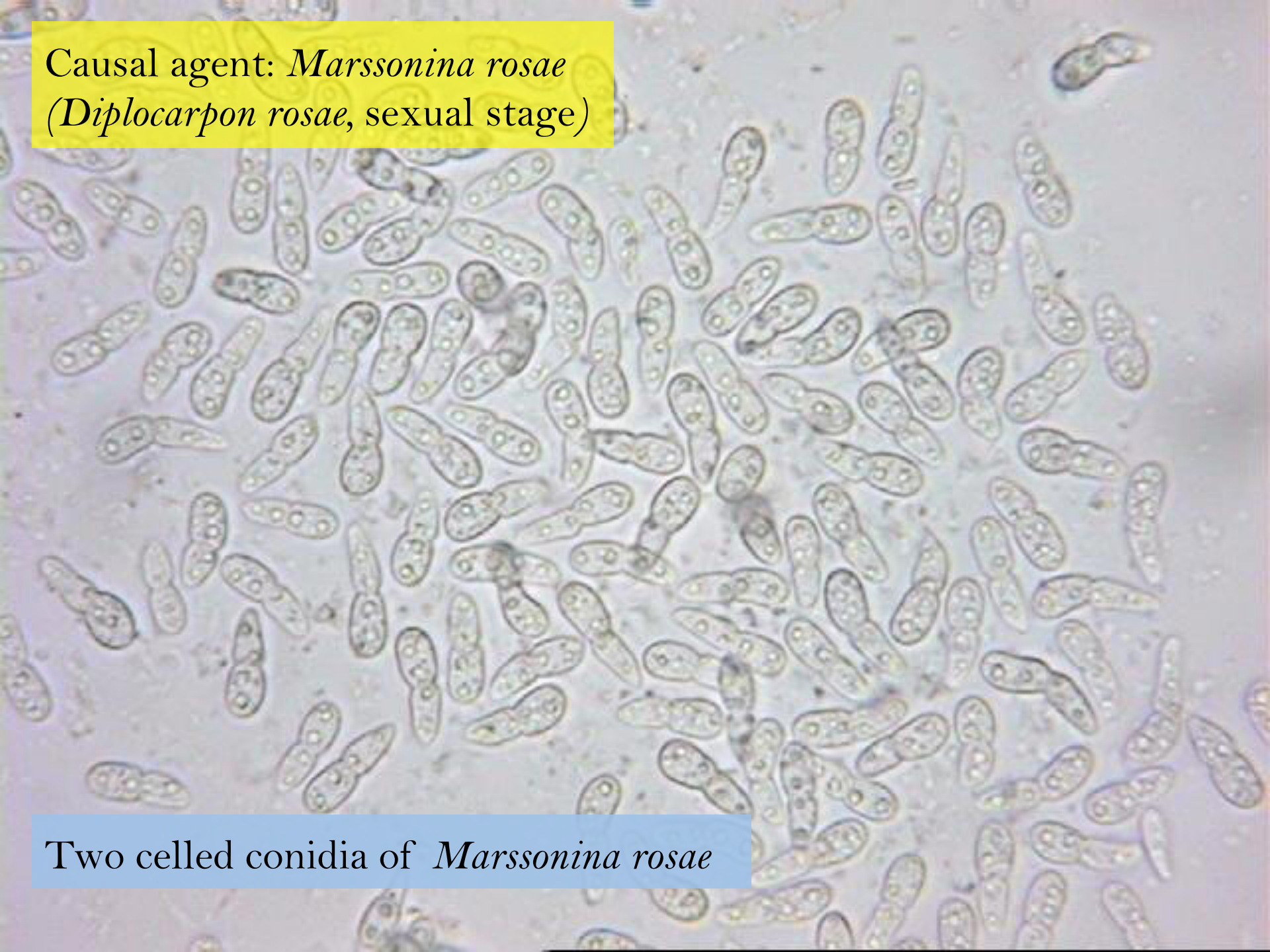

Causal agent: *Marssonina rosae*
(Diplocarpon rosae, sexual stage*)*
Two celled conidia of *Marssonina rosae*

The biology and management options

- *M. rosae* can survive a wide range of temperatures from 59-81˚F, even though the optimum is 64˚F. This wide temperature range allows the disease to develop as long as adequate moisture is available during the season.
- The conidia must be wet for several hours (>7 hrs) to infect plant tissues.

- **Management:** Overhead irrigation should be carefully monitored to prevent long duration of leaf wetness.

- *M. rosae* do not survive in soil, and conidia adhering to tools do not survive more than 1 month.
- The fungus overwinters as mycelia in fallen leaves or in infected canes that may produce new acervuli or apothecia in which conidia and ascospores form each spring.

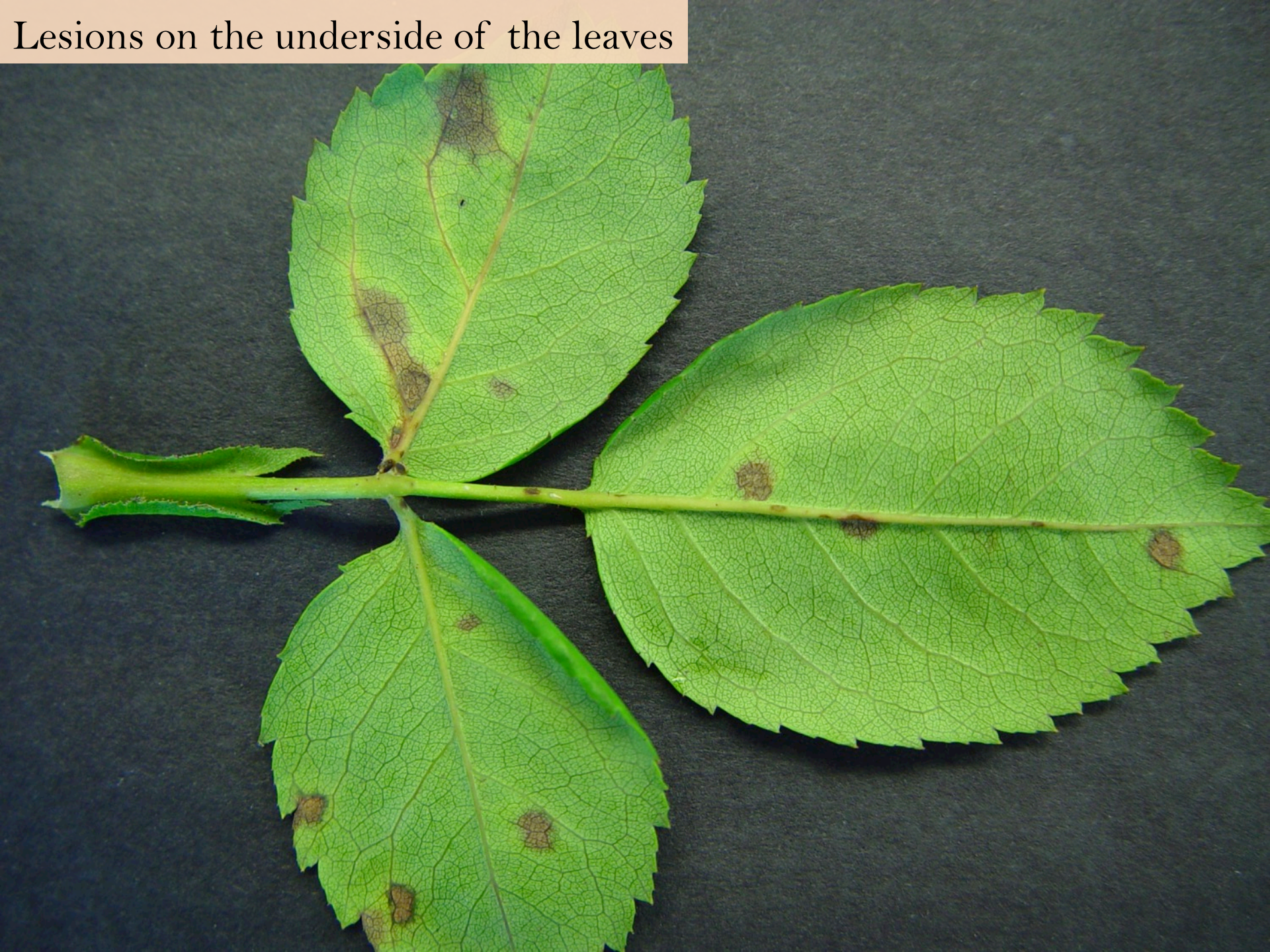
- **Management:** Infected plant parts should be destroyed to avoid seasonal carryover of the organism.
- Use highly resistant varieties. "Knock out series". (The occurrence of pathogenic races of the fungus makes it difficult to develop resistant varieties)

- **Preventative fungicide program is critical for management**

Cercospora leaf spot

Symptoms are circular spots usually 2-10 mm in diameter. The initial symptoms usually have a small purplish area.

Lesions on the underside of the leaves



As the disease progresses, the older lesions have small necrotic areas. Subsequently, the centers of the spots turn tan. The disease causes severe defoliation in heavily infected plants

In advanced necrotic lesions, groups of small tufts of conidiophores can be found. Conidiophores develop from masses of fungal tissue called stroma. Stromata are dark brown and appear as black dots over the necrotic area of the leaves

Causal agent: *Cercospora rosicola*
(Mycosphaerella rosicola; sexual stage)

http://edis.ifas.ufl.edu/pp267

Under the microscope, cylindrical, almost straight, septate conidia can be observed

http://edis.ifas.ufl.edu/pp267

Management options

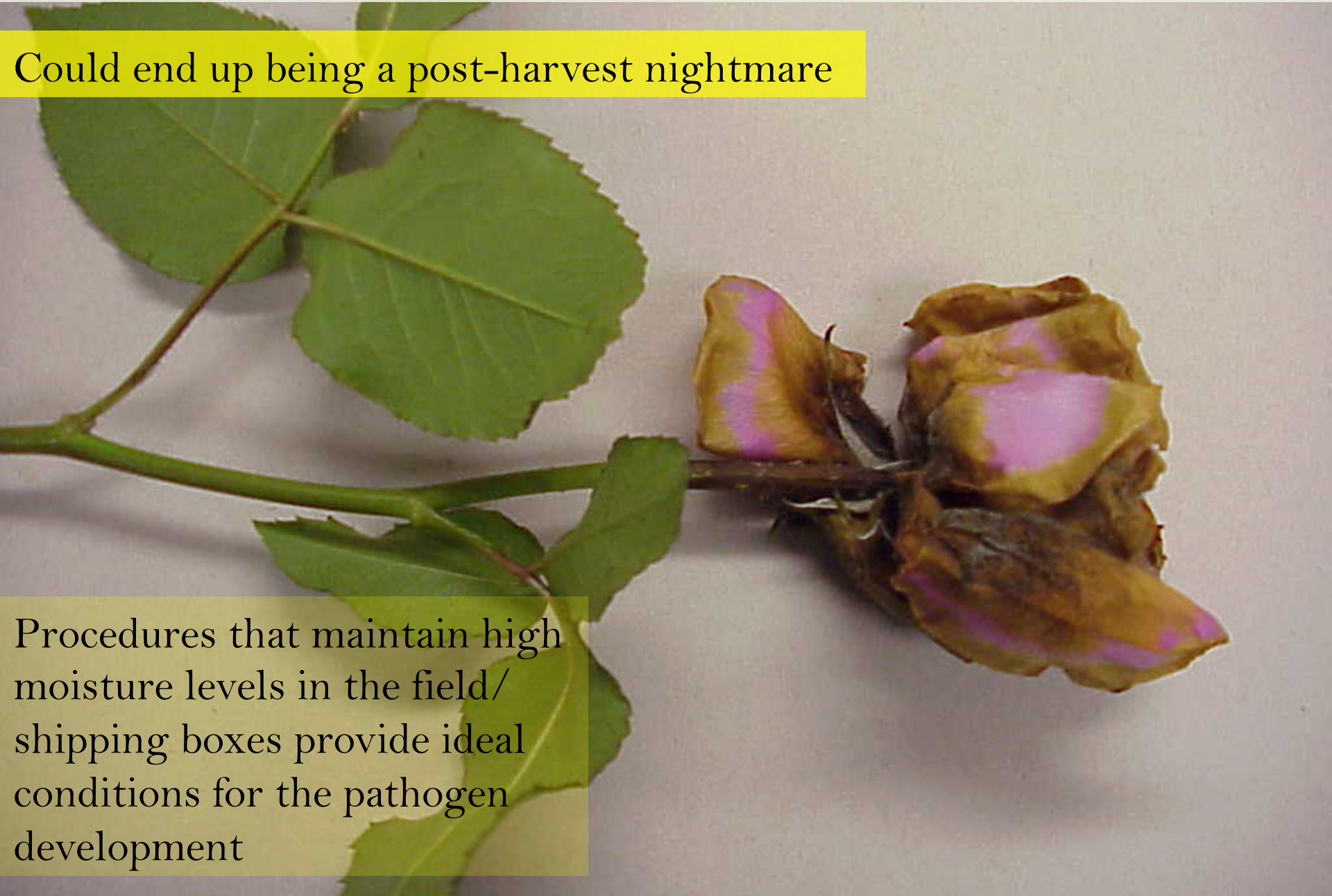
- Most of the management options for black spot are effective in managing *C. rosicola*

- **Management:** Overhead irrigation should be carefully monitored to prevent long duration of leaf wetness.
- Infected plant parts should be destroyed to avoid seasonal carryover of the organism.
- Many fungicides labeled for use against black spot can also be used against Cercospora leaf spot. Check

  http://premier.cdms.net/webapls/

  http://edis.ifas.ufl.edu/pp267

Botryitis blight (*Botrytis cinerea*)



Could end up being a post-harvest nightmare

Procedures that maintain high moisture levels in the field/ shipping boxes provide ideal conditions for the pathogen development

Management options

- Procedures that maintain high moisture levels in the field/ shipping boxes provide ideal conditions for the pathogen development.
- Infection can happen on stub ends from which flowers have been cut, or pruning wounds, leading to blighting of canes.

- **Management:** All infected buds, flowers, and canes in the greenhouse should be cut and destroyed at the first symptoms of Botyritis blight. This prevents the formation of large numbers of air-borne conidia.
- Focus on sanitation, and irrigation practices.
- Protective fungicide spray should be done on covered wounds. Stored roses should be sprayed, dipped with a fungicide when brought to storage. Rotate fungicide chemistries (resistant strains present)

Crown gall(*Agrobacterium tumefaciens*)

The bacterium *A. tumefaciens* enters the plant through wounds made during grafting, planting, pruning, or chewing insects. Often plants are infected in the nursery, and the disease develops later, after planting in the garden.

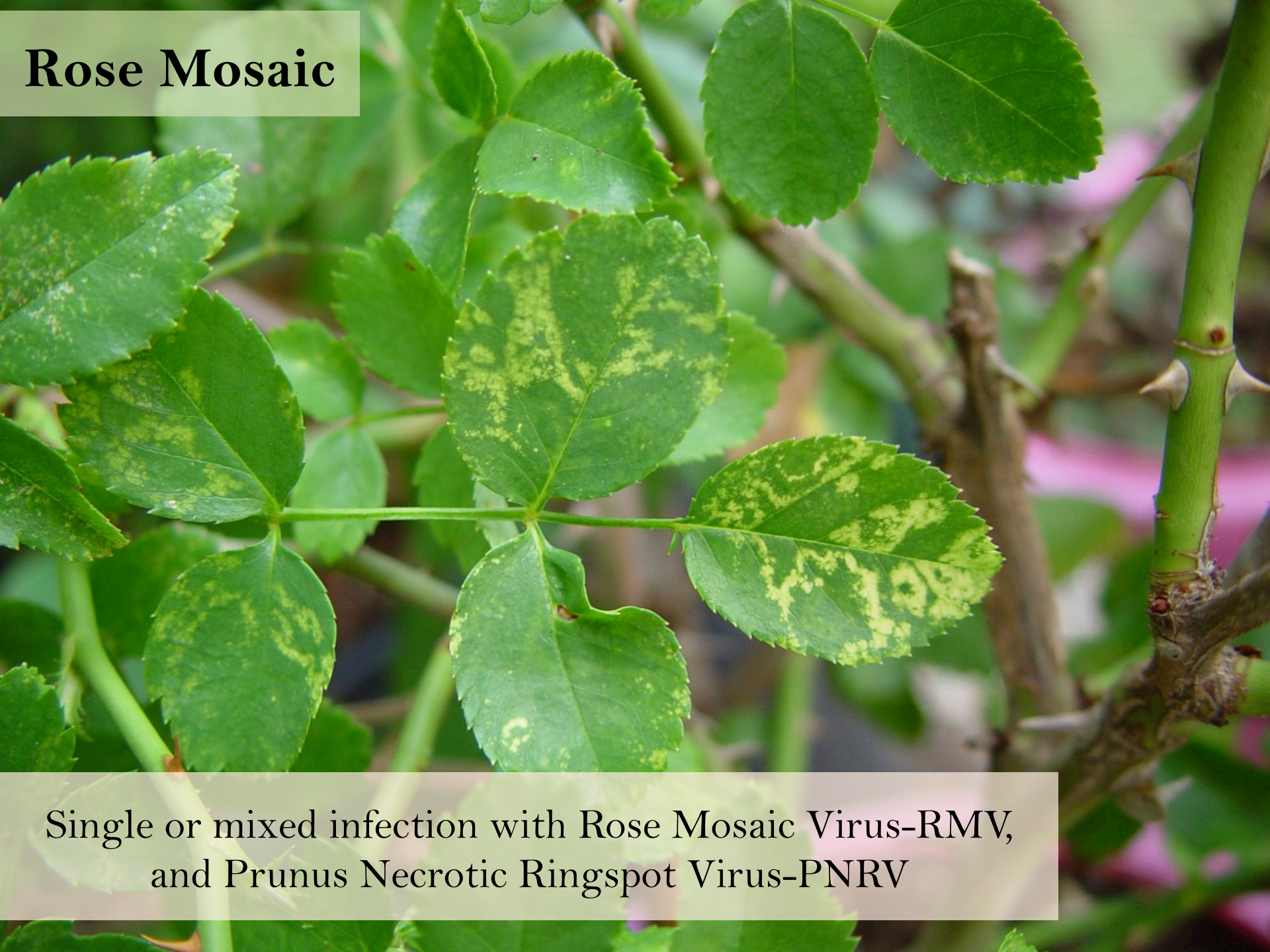
After the bacterium enters a wound, plasmid DNA is transferred from bacterium into the nuclear genome of the plant which transforms normal cells into tumor cells. The tumor cell formation becomes an autocatalytic process that continues independent of the bacterium.

Biology and Management options

- Bacterial activity is the highest during summer months.
- Pruning tools that cut through the galls or infected plant material spreads the disease around.
- The bacterium can survive in soil (~3 years), and be transported through water.

- **Management: Use** healthy rootstocks to begin with. Understand the fact that plants which look healthy may still harbor the bacterium.
- Use healthy fields with no history of crown gall.
- Minimize plant injury.
- Infected plants and soil around it should be removed immediately.
- Cutting, and pruning tools needs to be regularly disinfected to prevent carry over of the bacterium to healthy plants.

Rose Mosaic



Single or mixed infection with Rose Mosaic Virus-RMV, and Prunus Necrotic Ringspot Virus-PNRV

The symptoms of rose mosaic are highly variable. These symptoms may appear only occasionally, depending on weather and plant growing conditions.

Mottling of the leaves

Management options

- **Management:** Use virus-indexed plants
- Rose mosaic mostly reported in cultivars of American origin. Use resistant varieties when available.

Conclusions

- The diseases of roses relevant to Florida are manageable if the biology of the causal organism is well understood, and a good IPM practice is set-up.
- Any fungicide program without good IPM components (sanitation, irrigation management, maintenance practices, resistant varieties etc.) is bound to increase fungicide spraying, and thus significantly higher cost for management.
- Keep track of weather all the time. A preventative plan is always helpful.

Ref: Compendium of rose diseases and pests, 2nd edition, APS Press

- Field identification based on key symptoms caused by various pathogens can be an effective tool for rapid recommendations at the county level.
- However, if you are not sure, use diagnostic facilities at UF for definitive confirmation.

Contact for additional information

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