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Battling Botrytis Blight and Stem Canker on Greenhouse-Grown Tomatoes

Botrytis blight and stem canker — caused by *Botrytis cinerea*— is a prevalent problem on greenhouse-grown tomatoes, especially during spring days with cloudy, cool, overcast weather. In this Alert, we discuss how to identify and manage this disease.

B. cinerea has a wide-host range including many greenhouse-grown tomatoes, lettuce, peppers, herbs, small fruits, and many ornamentals. Losses to greenhouse tomatoes can occur during production, storage, and shipment. Botrytis can infect tomato leaves, leaf petioles, stems, flowers and fruits. Infections resulting in stem canker can cause serious losses.

What to look for (Signs & Symptoms)

Botrytis begins on leaves as light tan lesions (Figure 1) with concentric rings. Elliptical, concentric tan lesions develop at the site of pruning wounds completely girdling the stems (Figure 2). Senescing flower petals are also very susceptible and as they fall, this contributes to Botrytis developing on the leaves. Decaying flowers and leaves are food source for Botrytis. As tomato plants grow and develop a dense plant canopy (Figure 1), air circulation reduces and leaves surfaces remain wet, making them more susceptible to disease.

Leaving stubs on the plant stems (Figure 3) or wounding the stems, often leads to cankers that can completely girdle the stems. During humid conditions, characteristic gray fuzzy spores develop.

The spores also infect small, green fruit and cause white, light colored rings on the surface known as “ghost spots” (Figure 3). Ghost spots occur when Botrytis spores germinate and penetrate the young fruit. When the fruit have developed a shiny surface then they are not susceptible to infection (www.shorturl.at/OTV56). Although these infected tomato fruits do not rot, those fruits with ghost spot rings do not ripen normally. The halos appear yellow on ripe fruit.

Botrytis can also enter the tomato fruit from the top where water tends to puddle, causing a soft rot (Figure 4). Botrytis can also enter fruit from the blossom end (Figure 4).

USDA
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Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author and do not necessarily reflect the view of the U.S. Department of Agriculture

Figure 1. Early symptom of Botrytis blight. Light tan lesions on lower foliage. (Image Copyright: Richard McAvoy, University of Connecticut)

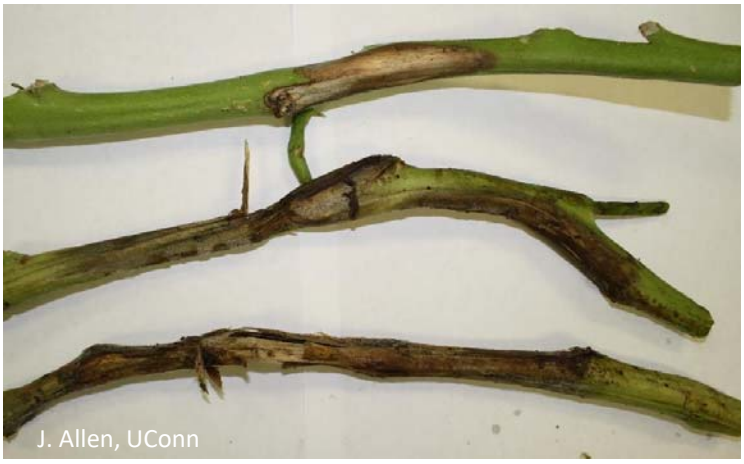


Figure 2. Botrytis stem canker symptoms. Elliptical, concentric tan lesions can develop at the site of pruning wounds completely girdling the stems. (Image courtesy: Joan Allen, University of Connecticut)

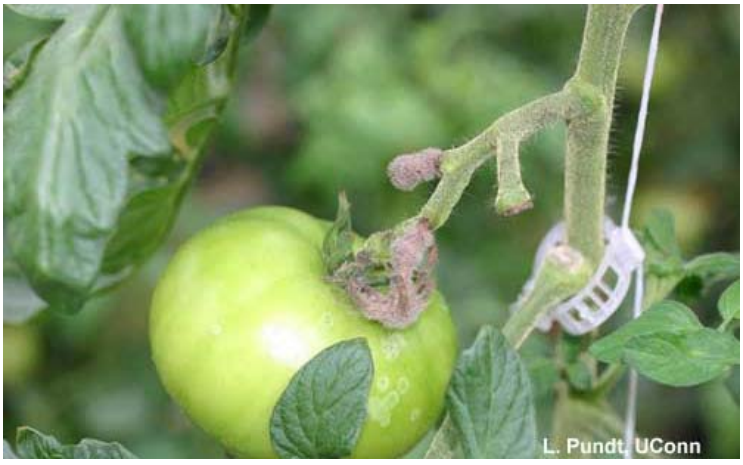


Figure 3. Plant stem stubs covered with Botrytis spores. Ghost spots on the fruit develop after infection, and the disease stops because the environment is not conducive. (Image Copyright: Leanne Pundt, University of Connecticut)

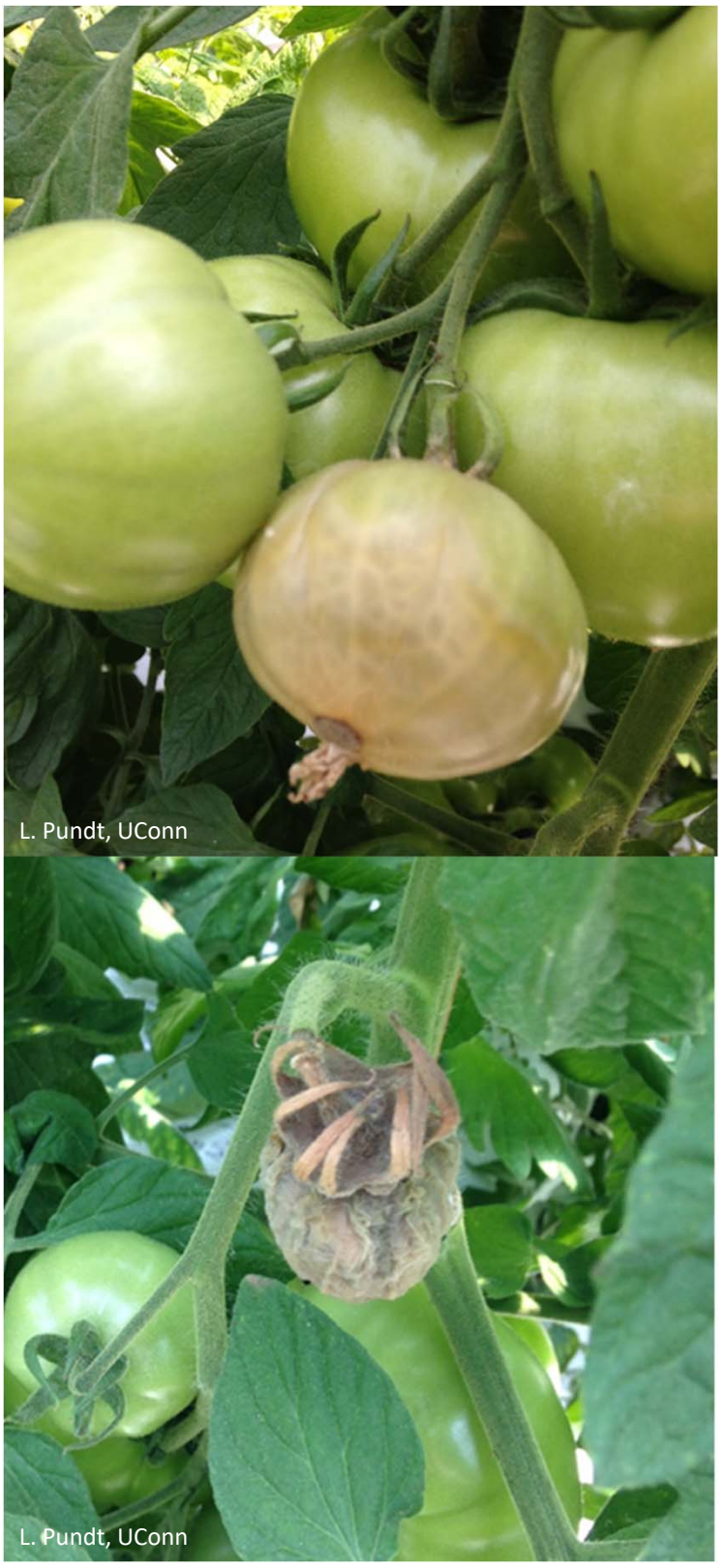
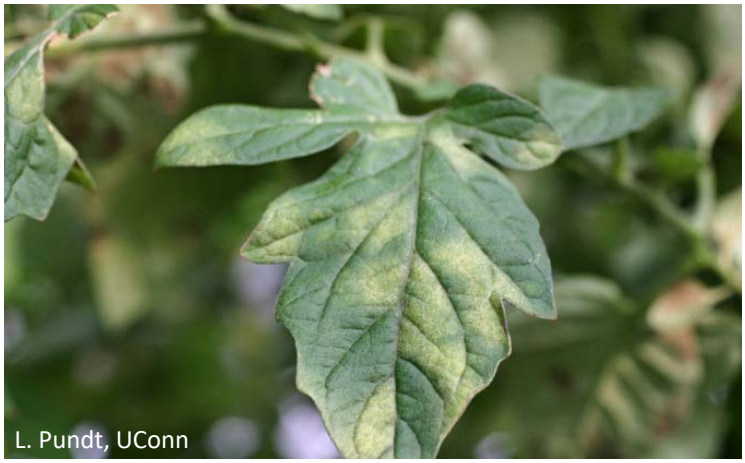


Figure 4. Fruit after infection with Botrytis. (Image Copyright: Leanne Pundt, University of Connecticut)

A few look alike could be confused with Botrytis blight.

Fulva leaf mold (caused by *Passalora fulva*) often starts on older leaves, with pale green to yellow spots on upper leaf surfaces, and a pale-green mold on the underside of leaves (Figure 5). Infected leaves curl, wither and may drop from the plant. A dark, leathery rot may develop at stem ends. Fulva leaf mold is host specific to tomato, and is more likely to be an issue in high tunnels where humidity control is especially challenging.



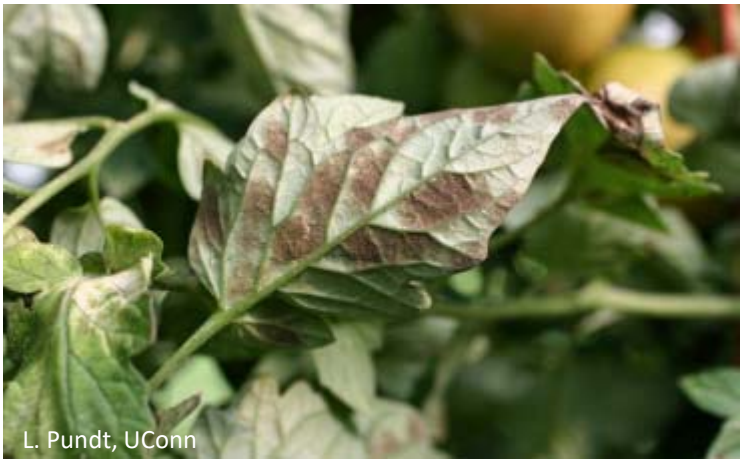


Figure 5. Leaf mold caused by *Passalora fulva.*

Rhizopus rot of tomato fruit starts as water soaked areas with white fungal mycelium and large masses of black-mustard-like spores. Tomato fruits can also have a fermented smell.

Late Blight (caused by *Phytophthora infestans*) is more of a problem in the field, but can occur in the greenhouses too (Figure 6). Sunken, dark green or brown lesions can develop on leaves and brown-stem lesions with white sporulation occurring under moist conditions.

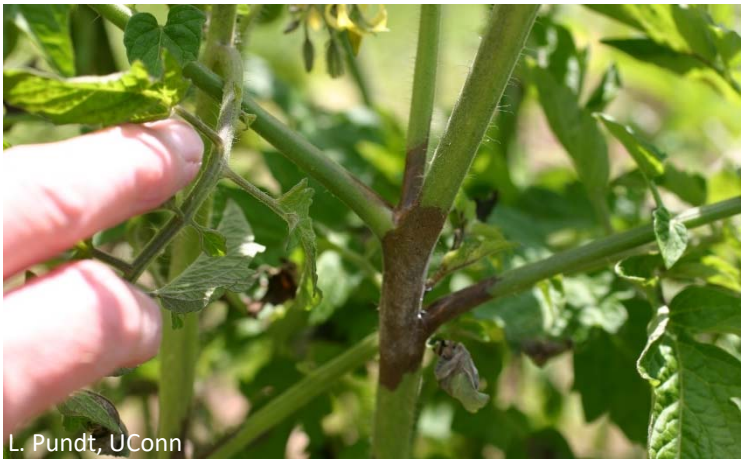


Figure 6. Late blight caused by *Phytophthora infestans*. Late blight cankers are dark, Botrytis cankers are light tan and concentric (Figure 1)

Sclerotina white mold also known as timber rot (caused by *Sclerotinia sclerotiorum*) causes infected stems to have a woody appearance, light gray, and dry lesions— and may be covered with white, cottony mycelium (Figure 7). Black sclerotia can be found inside the vascular system or on the outside surface of the stem.

Figure 7. Lettuce infected with *Sclerotinium* sp. (Image Copyright: Cora McGehee, University of Connecticut).

Disease Cycle

Botrytis has a very wide host range and can persist in greenhouses year round. Botrytis overwinters as mycelia on plant debris or weeds. It persists on living or dead tissue. The pathogen produces large number of spores that spread by air currents in the greenhouse, and as greenhouse workers move around the greenhouse.

Wounds on the stem when deleafing provide and ideal entry point for infection. Spores can be dormant for 10 to 12 weeks within these scars and then germinate when plants are stressed or when plant surfaces remain moist for 5 to 8 hours, with temperatures between 64°F and 74°F (18-23°C).

The pathogen will grow and form new spores that can further infect other plants or tissue. This results in an ongoing problem, if environmental conditions are conducive and not control is implemented.

In brief: Botrytis persists on living or dead tissue for long periods of time. Cool temperature, free moisture, and high humidity are conducive conditions for the disease to develop.

Management

There are no tomato resistant varieties available. Therefore, proper cultural and environmental controls are the first line of defense.

1.Keep a clean greenhouse.
Maintain a clean greenhouse throughout the growing season and disinfect surfaces at the end of the season. Remove all plant debris and discard infected tissue.

2. Avoid damaging plants and prune carefully.
The fungus enters the plant through wounds. Prune in the morning or early afternoon— allowing the wounds to dry quickly. Disinfect pruning tools after every use. Do not leave stubs. Clean up leaf pruning's daily, as long as you are not releasing the parasitic wasp *Encarsia* for whitefly management. More on: Pruning Greenhouse Tomatoes For Optimum Yield at http://www.e-gro.org/pdf/E208.pdf.

3. Keep plant surfaces dry.
Use Horizontal airflow fans to dry plant surfaces and provide enough space between plants (3.9-4.4 sq ft per plant).

4. Maintain low humidity and prevent dew formation.

Warm air holds more moisture than cool air. During warm days, the air inside the greenhouse is also warm, as the air cools in the evening, the moisture-holding capacity drops until the dew point is reached and water begins to condense on surfaces.

Prevent dew formation by venting the warm, humid air out of the greenhouse before the air temperature drops at dusk, follow by heating fresh air to maintain low relative humidity. Two or three heating/venting cycles may be needed to exhaust all of the moisture. More details on this process see: http://tiny.cc/tomatodiseases

5. Apply fungicides as a preventative measure.

Biological fungicides have multiple modes of action so can be part of your resistance management plan. For a list of products labeled for greenhouses refer to: http://tiny.cc/biofungicides

Conventional fungicides. Follow recommended resistance management guidelines on the fungicide label and rotate among FRAC codes. Resistance to certain fungicides has been reported.

Consult local agencies for specific fungicides recommendations in your region. For example:

- Tomato, Greenhouse and High Tunnel in: 2018-2019 New England Vegetable Management Guide. https://nevegetable.org/crops/tomato-greenhouse-and-high-tunnel
- Tomatoes news, programing, and other resources from MSU Extension. https://www.canr.msu.edu/tomatoes/index
- Integrated Pest Management for Tomatoes: http://ipm.ucanr.edu/IPMPROJECT/ADS/manual_tomato.html

References and additional resources:

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