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Massachusetts
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2020 Pesticide Safety August 20: 2020 Pathology Review

Item Type	article;article
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Download date	2026-04-16 07:35:34
Link to Item	https://hdl.handle.net/20.500.14394/8967



2020 Pathology Review

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Diagnostic Lab

- Phytophthora Rootrot
- Upright Dieback
- Few samples had both
- Few samples Pythium

Phytophthora Rootrot

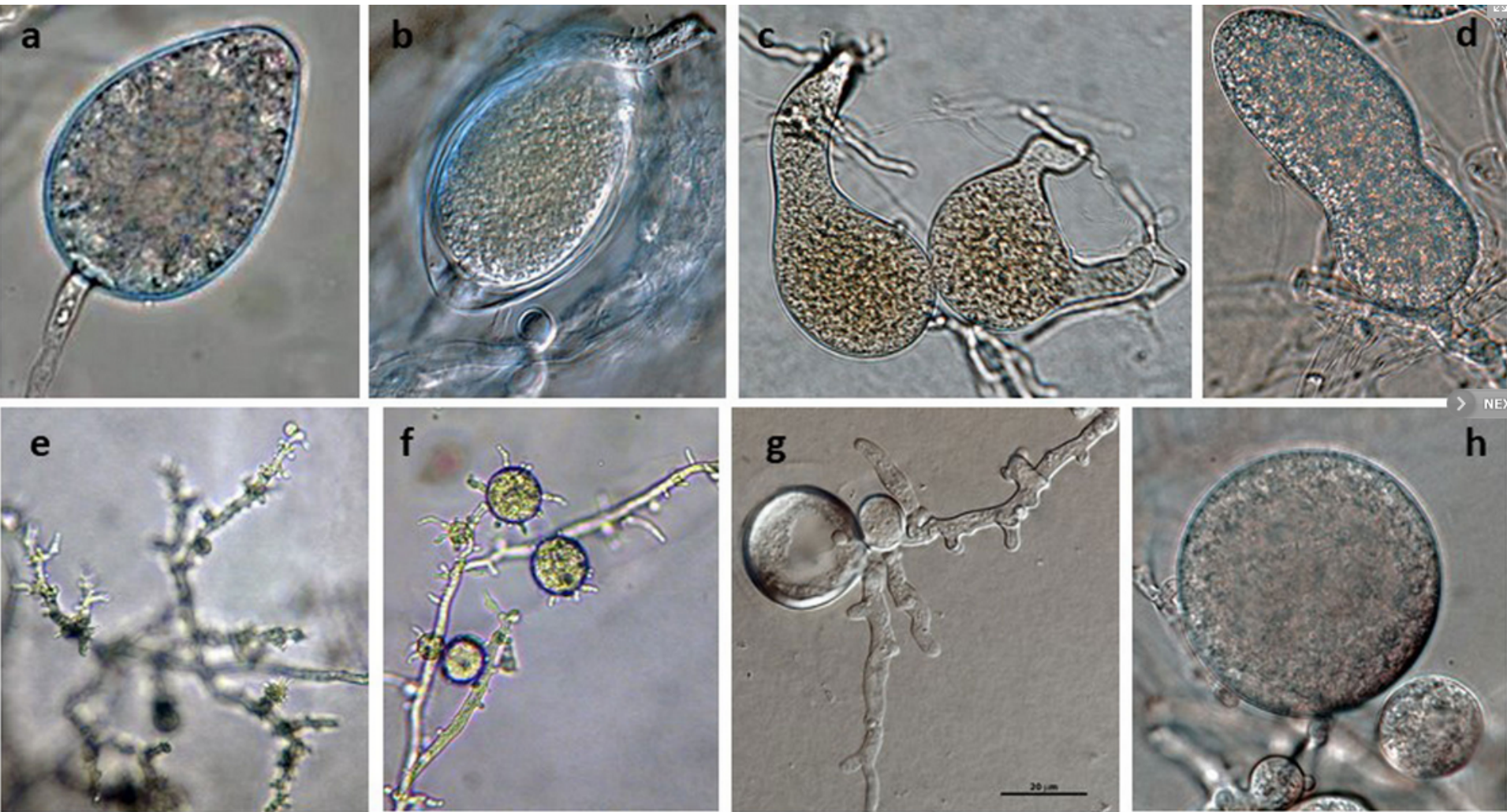
- This year's long, wet spring.
- The numerous frost nights observed in April and May resulted in **waterlogged areas** on several bogs, and increased likelihood of Phytophthora root rot (if the pathogen was introduced or already present in the bog).



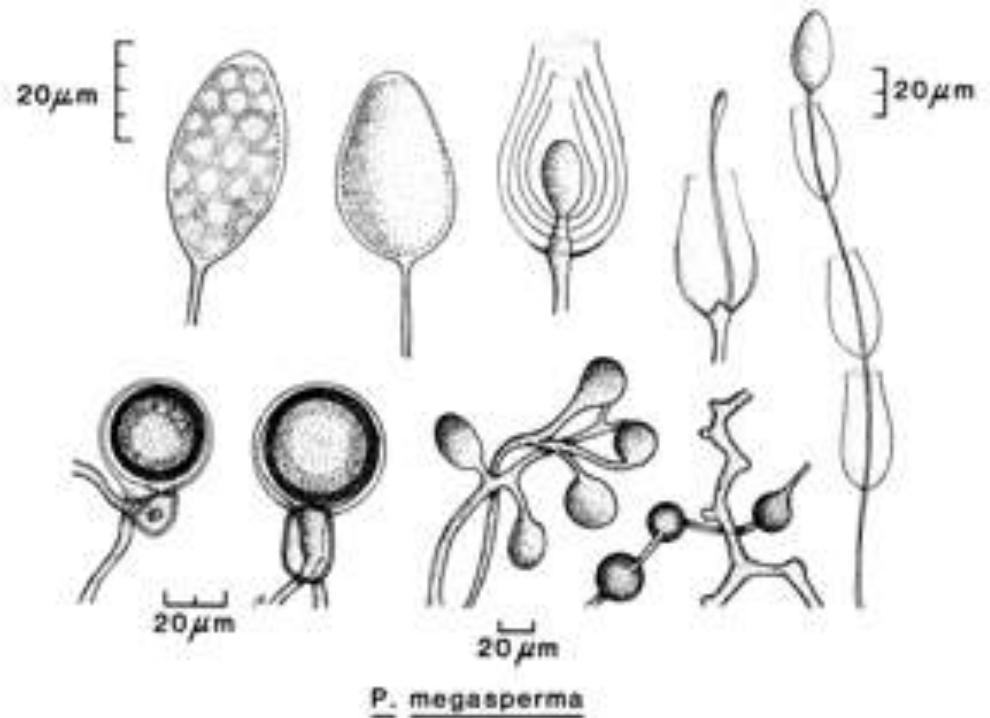


Phytophthora Rootrot

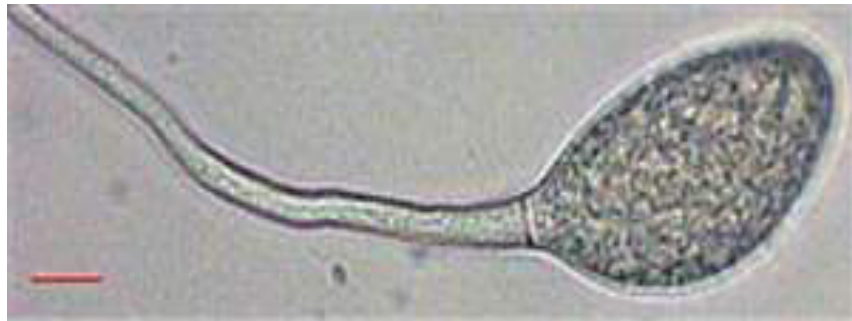
- Phytophthora root rot is caused by a **soilborne pathogen**, *Phytophthora* spp.,
 - *Phytophthora cinnamomi*
 - *P. megasperma*
 - *P. dreschleri*
- *Phytophthora* **thrives in poorly drained soils.**



Phytophthora cinnamomi selected specimen P6490 asexual phase (a-h): (a-d) different shapes of persistent sporangia, (e) typical coralloid mycelia, (f, g) hyphal swellings, (h) chlamydospore and hyphal swellings; photos by Gloria Abad, USDA-APHIS-PPQ.

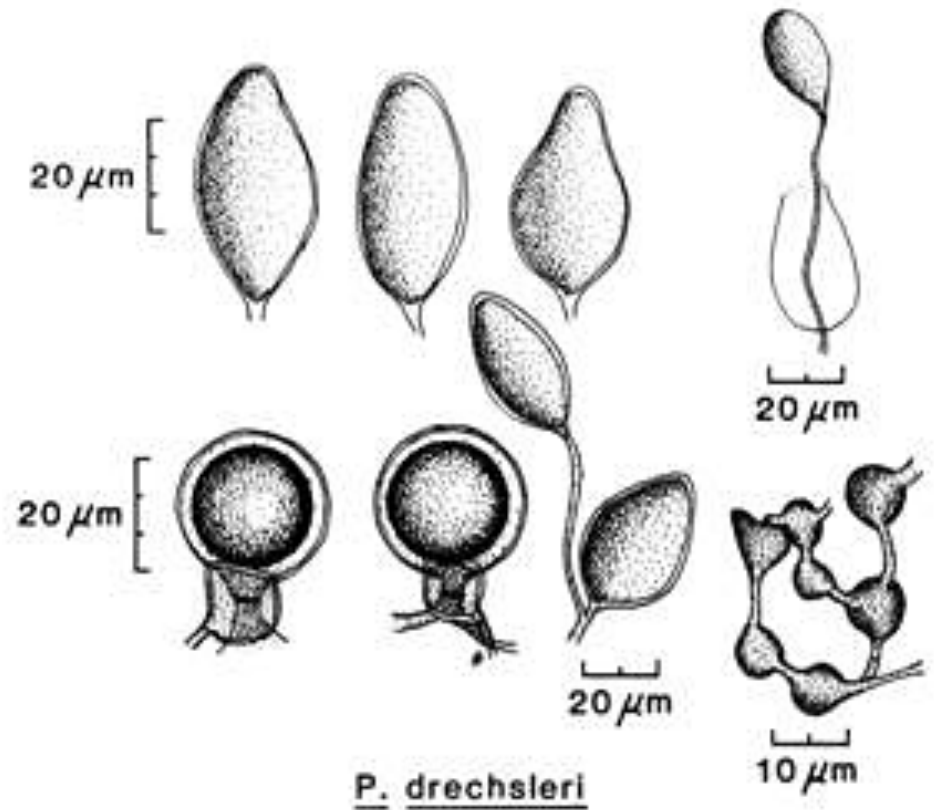


Morphology of *Phytophthora megasperma*. Upper row, Ovoid and obpyriform, nonpapillate sporangia; sporangium showing nesting or internal proliferation of a subsequently formed sporangium; sporangium with a new sporangium forming by external proliferation. Lower row, Oogonia, one with a paragynous antheridium and another with an amphigynous antheridium; hyphal swellings; sporangia forming by external proliferation. (Courtesy A. Vaziri; Reproduced from Erwin and Ribeiro, 1996)



Nonpapillate sporangium of *Phytophthora drechsleri*. Bar = 10 μm .

(Courtesy Elizabeth A. Bush;
Reproduced from Bush et al., 2006)



Morphology of *Phytophthora drechsleri*. Upper row, Nonpapillate, ellipsoid to obpyriform sporangia; internal proliferation. Lower row, Globose oogonia with amphigynous antheridia; sporangia forming in a sympodium; hyphal swellings formed in aqueous culture.

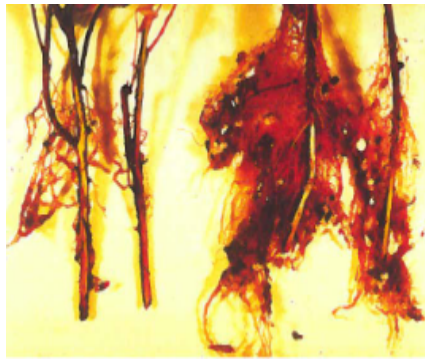
(Courtesy A. Vaziri; Reproduced from Erwin and Ribeiro, 1996)



Phytophthora Rootrot

- This pathogen **infects root tissues**, causing
 - poor new root development
 - necrosis
 - root rot
 - discolored lesions on the runners
- Affected roots...
 - cannot uptake water and nutrients.
 - results in dieback of plants.

Phytophthora Root Rot



Root symptoms



Phytophthora Rootrot

- Phytophthora also **increases fruit rot incidence** due to stress on the plants.



Phytophthora Root Rot Management

- ❖ **Improve drainage** of the low areas of the bed.
- ❖ Tile, stones or other materials can be utilized, and new ditches can be dug.
- ❖ **Sand the affected areas** to get them up to grade with the remainder of the bed.
- ❖ **Stressed plants** on the margins of dieback areas should be given **extra dose of fertilizers to stimulate root growth**.

Phytophthora Root Rot Management

- After improving drainage, fungicides should be applied.
- Multiple applications per season may be needed until vine recovery is visible.
- These applications can revitalize canopy by encouraging root growth and help the plant uptake water and nutrients.

Phytophthora Root Rot Management: Fungicides

- **Foliar application of Phosphonate fungicides**
(also called Phosphites):

eg: Phiticide

Rampart

Phostrol

ProPhyt

Fosphite

Fungi-phite

K-phite



Phytophthora Root Rot Management: Fungicides

- **Soil application of Phenylamide fungicides**

eg: Ridomil Gold SL

Ultra Flourish

Ridomil Gold GR

Phosphonates vs Phenylamides

- Phosphonate fungicides are less expensive (\$16-18/A at the highest rate) compared to the Phenylamide fungicides (\$70-200/A).
- Most of the phosphonate fungicides also offer the flexibility of multiple applications (at 14-30 days intervals) that can be applied till suitable control is achieved (< 7 days PHI).
- Please check the labels.

Phytophthora Root Rot Management

❖ Timing of fungicide applications:

1st: between April 25th to May 15th

2nd: 60-90 days after the first application.

(but before harvest)

3rd: After harvest, prior to November 15th.



Phytophthora Management in Renovations

- **Basamid fumigation prior to planting** was recommended for renovations that had a history of Phytophthora infestation in the soil.
- It is a granular soil fumigant that sterilizes soil and eliminates weeds, grasses, nematodes and disease.
- **New EPA regulations require EPA fumigant training** to use this chemical.

If you suspect **Phytophthora root rot....**

- **Sample collection instructions :**
 - From **the margins** of the affected areas.
 - **Collect around 40 stressed vines** adjacent to the dead vines with roots attached.
 - **Roots** are the most important part of diagnosing this disease.
 - If several spots show symptoms in a single bog, sample from at least 10 areas and combine them into one bag.
 - Make sure you **keep samples from different beds/cultivars in separate bags.**

Sample drop off instructions :

- To reduce person-to-person exposure under the current global pandemic, we request that you notify me of your expected time of arrival by phone (text or call 334-728-1025) or email (suppala@umass.edu) at least a day before bringing samples.
- We will arrange a cooler & sample intake forms outside the Cranberry Station's lab building.

Phytophthora Root Rot Management

- Precautions should be taken to avoid the spread of the pathogen from infested beds to uninfested beds.
- It just takes a few infected roots to initiate and spread the disease to a new location.
- Machinery, equipment, footwear etc. should be sterilized using steam, 10% bleach or 70% alcohol.



Phytophthora Root Rot Management

- Pathogen spores could move within and among the bogs through water too.
- If possible, the sequence of flooding the beds during water harvest should be adjusted to flood heavily infected beds last.

How to produce high quality fruit...

- Monitor soil moisture and depth to water table to schedule irrigation.
- A water level float or tensiometer could be used.
- Proper water management can assure good fruit quality and high yield.

If the bed is too wet: fruit rot is more likely.

If it is dry due to under-irrigating: lead to poor fruit quality due to transient shriveling/softening on hot days, a condition that can hasten physiological breakdown of the fruit.

How to produce high quality fruit...

- Irrigation management:
 - When necessary, bed should be **adequately watered in the early morning** (prior to the onset of heat).
 - **Morning watering** allows vines to be watered with **minimal evaporation and allows easy drying** of the surfaces in the sun's heat.
 - If watering is done in the **early evening, the vines remain wet for the extended periods**, thus creating favorable conditions for infection by the fruit rot fungi.



How to produce high quality fruit...

- Irrigation management:

On hot days (>100 F on the bed), particularly in **newly planted or recently sanded beds**, sprinklers should be run in the late morning or early afternoons to cool the vines and berries.



SCALD

- Green fruit are especially susceptible.
- Scalded berries are browned on one side, with a clear demarcation between the brown area and the green area of the fruit.
- After 7 days, a scalded berry will be hard to discern from a totally rotted berry.



Beware of Scald conditions...

- Critical conditions include:
 - a. off-bed temperature greater than 80°F.
 - b. dewpoints less than 55°F midday and early afternoon.
 - c. clear or scattered skies during the day.
 - d. Wind speed greater than 11 mph.
 - e. Dry soil and no rain or irrigation in 48 hours.



Beware of Scald conditions...

- Even if no scald damage occurs, **temporary softening of the fruit due to inadequate moisture** can result in compromised fruit quality at harvest and in storage.
- During hot conditions, it is critical that the bed be **adequately watered prior to the onset of the heat.**



- In a well-rooted cranberry bed with adequate moisture in the soil at the beginning of the day, plants should be able to move enough water through and out of the leaves to provide cooling to the fruit and avoid scald damage.



During harvest....

- Minimize mechanical injury to fruit during dry harvesting.
- Minimize the time berries sit in the water during wet harvesting.



After Harvest...

- Post-harvest (but before freezing conditions), **use a trash flood** to remove missed leaf and fruit litter from harvest.
- **Trash piles** should not be left next to the bed and should be **moved at least a quarter mile** from the bed if possible.
- **Consider composting leaf trash** (see the Composting Cranberry Leaves BMP for instructions).

Profiling of fruit rot fungi

- If you wish us to **profile fruit rot fungi from your bogs**, please consider dropping fruit samples in late September or early October.
- **If you suspect fruit rot fungicide resistance**, then also please drop fruit samples.
- Along with samples, please provide **fungicide usage data** (timing and product applied) from the past couple of years.



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