



Redwood Barn Nursery

1607 Fifth Street Davis, California

The perils of phytophthora

... and other spring diseases

The youngest kid gets told the weirdest things.

When a first-born asks a question, the parents sit down and, especially if they're scientists, explain the answer in great detail. A half-hour later the slack-jawed youngster's head is crammed with details about every facet of the subject.

By the time the third kid comes along, we get conversations like this one, on St. Patrick's Day, elementary-school age:

"Are we Irish? Should I wear green to school?"

Doesn't even look up from his paper. "Nah. You should wear orange."

Fortunately, I didn't. But this was on par with his casual comment one time that one of our ancestors "had created a golem." Different ancestors, obviously, but in both cases more information might have been useful.

"What's a golem?"

"It's kind of like Frankenstein." End of conversation.

I am convinced that youngest kids are brighter because we have to go look things up for ourselves.

In the case of the "are we Irish" question, dad missed an opportunity to explain why so many people immigrated to America from Ireland: *Phytophthora infestans*, commonly known as Potato blight. Americans would probably not even celebrate St. Patrick's Day were it not for the decimation by potato blight of the stored potatoes in Ireland (and Sweden and various other countries) which led to widespread famine and the subsequent migration of 1.5 million Irish to our shores.

In terms of their economic, ecological, and social impacts, it would be hard to top the organisms in the genus *Phytophthora*.

The water molds

When I was a student, phytophthora were classed as fungus in the order Oomycetes. Now, to quote a mycologist, "Oomycetes are eukaryotic microorganisms morphologically similar to but phylogenetically distant from true fungi."¹ We call them water molds, but they aren't related to common molds (which are actually fungi). Something about their swimming asexual spores and the presence of tinselated and whiplash flagellae. They get to share a taxonomic kingdom with some algae and diatoms now.

Serious pests of crops and ornamentals

There are species of *Phytophthora* that attack tropical crops such as cacao (cocoa), coconut, pineapple, and papaya; others attack avocados, tobacco, and garden fruits and vegetables.

¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4066925/>



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For over two decades now, native oaks on the north coast of California have been killed by an introduced pathogen: *Phytophthora ramorum* (Sudden Oak Death). “It is estimated to have killed more than a million oak and tanbark oak trees” between 2000 – 2010². The disease can cause symptoms on nearly every woody native plant species in our coastal forests and is fatal to several species.³ There are strict quarantines on the movement of nursery stock and firewood in and from those counties.

A common problem here is a “sudden death” of native and drought-tolerant plants in newly-planted landscapes. Plants die abruptly during hot weather, usually when they are being irrigated frequently and moisture is trapped against the woody stem by soil or compost. That point on the plant is called the crown, so we call this disease “crown rot,” and it is caused by various species of phytophthora.

It can be oddly random. In a row of lavenders, two may die abruptly while the others are fine. That’s typical of crown rot. Often the plants affected were planted too deep. It’s important not to plant shrubs or trees any deeper than they were in the nursery container. To prevent crown rot, water deeply and as infrequently as the plants can tolerate. The soil surface should dry a bit between waterings. Short, frequent waterings via drip irrigation, buried near the plant, can be a factor if the system is running daily.

Every disease has an optimal range of temperature and moisture for infection. With crown rot of woody plants, it requires high temperatures (90’s or warmer during the daytime), with high moisture. This means 90% humidity, or standing water around the plant, for 12 to 24 hours. Those conditions would not naturally occur here, pretty much ever. Our summers are dry. Crown rot attacks when we water too often, with moisture retained around the crown of the plant, especially during a heat wave.

Plants that never evolved with high-temperature, high-moisture conditions are especially vulnerable to crown rot. Unfortunately, that includes many of our native shrubs and trees, and plants from similar rainfall-cycle regions such as the Mediterranean. New low-water landscapes often have higher loss rates during the first growing season. Those plants need careful irrigation as they are getting established. Calibrating the application of water to strike that balance between what the plants need and what might kill them can be tricky.

My lemons are all rotting!

Compared to what happened to the Irish, your spoiled lemons may seem like small potatoes (I couldn’t help myself). But in a year when most have bumper crops, it’s frustrating to watch them soften and mold in such great numbers.

We’ve had optimal temperature and moisture range for some other species of phytophthora, a disease which attacks citrus trees here in wet winters. Spores of *Phytophthora citrophthora*

² <http://ipm.ucanr.edu/PMG/PESTNOTES/pn74151.html>

³

https://www.researchgate.net/publication/228697725_Phytophthora_ramorum_and_sudden_oak_death_in_California_I_Host_relationships



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(pronounce that? Ok: *Fie-toff-thuh-ruh si-troff-thuh-ruh*), or a couple of other species, splash up from the soil onto the leaves, branches, and low-hanging fruit during heavy rainfall. The fruit rots as it is ripening and twigs and branches may be killed. Even a healthy-looking branch may have all the fruit rotting on it.

This one is called Brown Rot of Citrus. I remember serious outbreaks in 1982-83, in 1995 and 1998, and we're seeing a lot of it this year.

What to do?

There's no spray to use at this point. For now, just pick up fruit that's spoiling on the ground and dispose of it. Prune up the lowest branches to get better air movement. When you start watering this summer, use soakers or drip rather than sprinklers. Next fall you may want to spray under the tree and into the lower branches with copper fungicide⁴.

Similar problem, different disease, this time a bacterium:

I have seen several samples of rapid dieback on citrus, notably lemons and kumquats. One branch of the tree may quickly lose leaves, smaller twigs are killed and there's lots of leaf yellowing.

This one is Citrus blast, again prevalent due to ongoing rainfall. The disease organism is *Pseudomonas syringae*. Look for black lesions in the leaf petiole (the part that attaches to the stem) which progress into the leaf itself. Diseased areas have a reddish-brown scab, and you may see small black spots on the fruit.

We just prune out the dead parts in spring after the rainy season has passed. Spraying is usually not necessary.

Citrus in the news

None of the foregoing are related to the citrus pest that made headlines (again) recently. The find of a single Asian citrus psyllid (*sill-id*; the p is silent) in Sacramento prompted a new quarantine, pulling that county into the same quarantine zone that Yolo has been in since one of the psyllids was found in West Sac a couple of years ago.

The disease that citrus growers and home gardeners are so concerned about is called Huanglongbing, abbreviated HLB. It is a bacterium which clogs the phloem of the tree, resulting in small, bitter fruit, reduced yield, and ultimately death of the tree.

The insect is the vector, meaning it transmits the disease if it (the insect) happens to be carrying it. The disease itself is confined so far to Southern California. The psyllid is spreading steadily up the state. The hope is to slow the spread of the insect and continue to search and destroy infected trees down south in order to keep the disease out of orchards and home gardens elsewhere.

⁴ <http://www.cacitrusmutual.com/wp-content/uploads/2015/12/Citrus-Brown-Rot-Management.pdf>



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It is hard to overstate how devastating HLB has been to Florida citrus growers. As reported in the L.A. Times⁵, almost ¾ of Florida's citrus production is gone. We want to avoid that here.

The International Research Conference on Huanglongbing was held in Riverside in March, and there was some good news. HLB-sniffing dogs have proven very accurate at finding infected trees, providing much faster results than standard lab tests. Several strategies are being researched, from releases of natural enemies of the psyllid to genetic modification of citrus trees to make them resistant to HLB.

Management of this pest is why you can't find organically-grown citrus trees. CDFA mandates the young nursery stock be treated, and the trees must be sold with the treatment tag attached.

Bottom line: you're not seeing symptoms of HLB here. You're probably not seeing the Asian citrus psyllids, but it doesn't hurt to learn what they look like. For more information, see the CDFA website⁶.

If your citrus looks sickly, you're likely seeing phytophthora, or citrus blast, or maybe just the common yellowing of some older leaves on citrus as they start to put on new growth. It's a good time to fertilize citrus trees. Picking up and disposing of spoiled fruit can go a long way to preventing trouble next year.

Continued rainy weather is going to increase the prevalence of many other diseases, including rust and downy mildew on roses, fireblight on apples and pears, and more.

For all these disease problems, what we really need is several days of sunshine and even a good strong north wind to dry things out. If only we could control the weather. Maybe I can summon up that golem. Wait, I looked it up: that doesn't end so well. We'll just have to wait for nature to right itself.

⁵ <https://www.latimes.com/food/la-fo-citrus-greening-20190329-story.html>

⁶ <https://www.cdfa.ca.gov/plant/acp/>



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Initial points of infection on citrus fruit can be caused by several organisms. This may be brown rot beginning to spoil the fruit. Further along the fruit will be soft and even moldy on the bottom. Pick off and pick up as much spoiled fruit as you can and put it out in the trash bin.



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With continued rainy weather, we expect other plant diseases to be more severe this year than usual. This picture of the early infection of fireblight, a bacterial disease that affects apples and pears and related plants, was taken in early April during a wet season a few years ago. It is difficult to control. Planting resistant varieties is often the best option. Prune out killed sections in summer, after the disease cycle has passed.



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With continued rainy weather, we expect other plant diseases to be more severe this year than usual. The first infections of downy mildew on roses began about a week ago locally. Here the disease has penetrated the leaf vein and killed the parts beyond the point of infection. Many leaves will drop with repeated infection, but the disease cycle ends quickly and the plants outgrow it.



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With continued rainy weather, we expect other plant diseases to be more severe this year than usual. Rust is a fungus on roses, readily identified by the orange spores on the undersides of the leaves and small yellow spots on the upper sides. The spores splash up higher onto the bush during periods of heavy rainfall. It is not readily controlled with fungicides. Heavily infected plants can be pruned back hard after the initial bloom to remove the spores. Water with drip or soakers rather than sprinklers to avoid having the disease continue into summer.