



Diagnosis of Wood Canker Causing Pathogens in Dried Plum


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Prune Crown, Trunk and Branch Diseases

Brown Line – Tomato Ringspot Virus

Bacterial Canker – Pseudomonas syringae

Ceratocystis Canker – Ceratocystis fimbriata

Cytospora Canker – Cytospora leucostoma

Oak Root Fungus – Armillaria mellea

Phytophthora – multiple species

Foamy Canker – possibly Zymononas species

Crown Gall – Agrobacterium tumefaciens

Botryosphaera/Phomopsis – fungal pathogens

Brown Line

- **Caused by tomato ringspot virus transmitted by dagger nematodes**
- **Peach, Myro or 29C tolerant. Marianna 2624 resistant.**
- **Look for brown line at the graft union.**

Brown Line



Bacterial Canker

- Complex disease that is poorly understood.
- All prunus species are susceptible.
- Caused by the bacterium *Pseudomonas syringae*
- Symptoms usually found late winter into spring.
- Can be very destructive to trees 2-6 years old.
- Pathogen is present on plant surfaces and invades through openings
- More associated with tree stress – heat, cold, moisture, nematodes



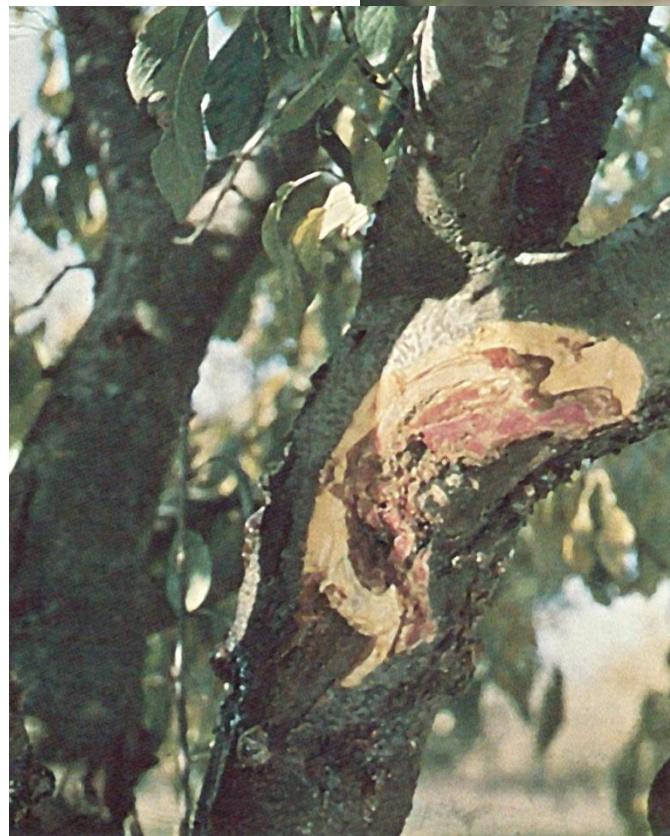
Bacterial Canker

Ceratocystis Canker

- **Caused by the fungus *Ceratocystis fimbriata***
- **Almost all infection occurs in bruise type injuries to trunk and scaffold branches.**
- **Cankers are most active during the growing season.**
- **Brownish to red canker with amber gum at the canker margin.**
- **Usually associates with mechanical-harvest injury.**



Ceratocystis Canker



Cytospora Canker

- **Caused by the fungus *Cytospora leucostoma***
- **Usually visible as dark depressed areas in the bark.**
- **Factors that favor Cytospora are moisture stress, potassium deficiency, heavy clay soils, ring nematode and sunburn. Canker development favored by heat.**
- **Most infection occurs in sunburn injuries from rain splashed spores.**
- **Look for small, grey-white pimple like spore bodies protruding through the outer bark of the canker.**

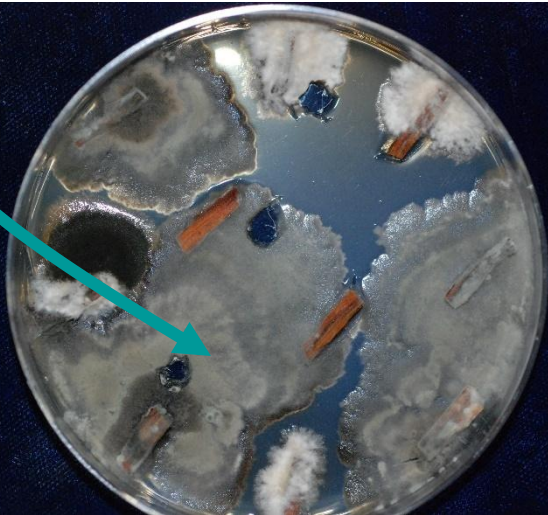
Cytospora Canker



Cytospora Canker



Cytospora leucostoma





Oak Root Fungus

- Caused by the fungus *Armillaria mellea*
- Soil borne fungus attacking crown and roots.
- Characterized by white/yellow pan shaped plaques of mycelial mats ranging from ½ to 2 inches in diameter.
- Rhizomorphs – brown to black flattened shoestrings on the surface of roots and crowns.
- Mushroom clusters usually following rain October – February.

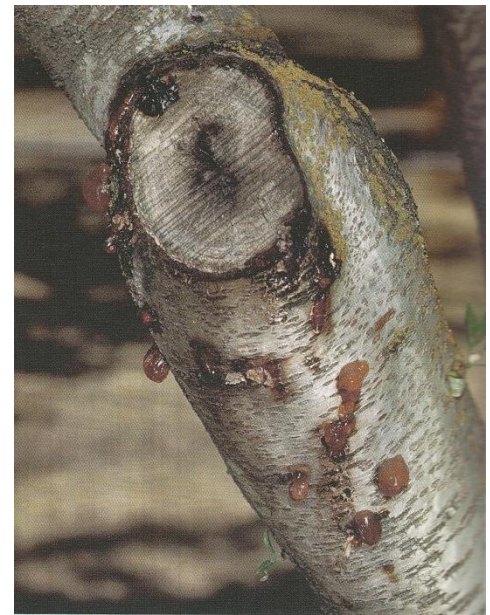
Oak Root Fungus



Phytophthora Crown and Root Rot

- Usually soil borne fungus attacking crowns and roots may cause aerial cankers and infest pruning wounds. Caused by multiple species.
- Dead tissue at the base of infected trees. Removal of the out bark reveals dead, brown bark with a zonate appearance at the margins between healthy and infected tissue.
- Cankers spread laterally and vertically eventually girdling the trunk.

Phytophthora species



Foamy Canker

- Cause uncertain, possibly *Zymononas* species plus a yeast – not common in prune.
- Watery, reddish gum drain down the scaffolds and trunk to form a puddle on the ground.
- Under the bark the cambium is rotted, white and mushy.



Foamy Canker



Crown Gall

- **Caused by the bacterium *Agrobacterium tumefaciens*.**
- **Bacteria are wide spread and occur in most agricultural soils. Usually need an injury to enter.**
- **On prune, galls can form on the roots, crown and trunk. Sometimes visible at ground level but many are below ground and not visible.**
- **Lack of vigor, open canopies, yield reduction and poor growth. Often an entry point for secondary wood rotting fungi.**



Crown Gall

UC Statewide IPM Project
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Botryosphaeria and Phomopsis

- Are fungal pathogens.
- Causes cankers and limb dieback – dead sunken areas on branches and brown dead tissue underneath.
- Can be a serious disease of pistachio and a potentially increasing issue for walnut and prune.
- Under evaluation by UC Plant Pathologist Themis Michailides.



Botryosphaeria canker

Sometimes Cytospora & Botryosphaeria together



Botryosphaeria species

A petri dish showing a dark, fuzzy fungal growth. A teal arrow points from the label to the dark, fuzzy growth at the top of the dish.



Phoma species

A petri dish showing a white, fuzzy fungal growth with numerous small, dark, circular spots. A teal arrow points from the label to these spots.



Phomopsis species

A petri dish showing a white, fuzzy fungal growth with numerous small, dark, circular spots. A teal arrow points from the label to these spots.



Branch Canker symptom in the Orchard



Species of *Botryosphaeriaceae* and *Phomopsis* that cause cankers and blights in tree nuts grown in California

Fungal species	Almond	Pistachio	Walnut
<i>Neofusicoccum nonquaesitum</i>	+	---	---
<i>Neof. parvum</i>	+	+	+ ^b
<i>Macrophomina phaseolina</i>	+	+	---
<i>Neof. mediterraneum</i>	+	+	+
<i>Botryosphaeria dothidea</i> ***	+	+	+
<i>Diplodia seriata</i> ***	+	+	+
<i>Dothiorella sarmentorum</i>	+	---	---
<i>Lasiodiplodia theobromae</i> ***	+	+	+
<i>Nattrassia mangiferae</i> ***	+	---	+
<i>Phomopsis</i> ***	+	+	+

*** in prunes

Isolations from wood cankers and problematic *Prunus* tissues

Year	Prune	Peach	Plum	Cherry
2006	<i>Cytospora leucostoma</i> <i>Phytophthora</i> (roots)	<i>Cytospora leucostoma</i> <i>Armillaria</i> (roots)	Blast <i>Sclerotinia sclerotiorum</i>	
2008	<i>Cytospora leucostoma</i> Phytotoxicity (oil damage)			<i>Cytospora leucostoma</i>
2009	<i>Cytospora leucostoma</i> (<i>Leucostoma sincta</i>) <i>Diplodia seriata</i>	<i>Lasiodiplodia theobromae</i>		<i>Cytospora leucostoma</i>
2010	<i>Cytospora leucostoma</i> <i>Lasiodiplodia theobromae</i> <i>Nattrassia mangiferae</i> <i>Paecilomyces variotii</i> , <i>Phoma</i> species			<i>Cytospora leucostoma</i>
2011	<i>Cytospora leucostoma</i>			<i>Cytospora leucostoma</i>
2012	<i>Cytospora leucostoma</i> <i>Fusarium</i> species	Bacterial canker		Bacterial canker <i>Botryosphaeria</i> sp. <i>Cytospora</i> , <i>Fusarium</i> , <i>P. variotii</i>
2013	<i>Cytospora leucostoma</i> , <i>Paecilomyces variotii</i> , <i>Chondrostereum purpureum</i> , <i>Botryosphaeria</i> spp., Foamy canker ?	<i>Cytospora leucostoma</i> <i>Lasiodiplodia citricola</i>	---	Blast (<i>Pseudomonas syringae</i>) <i>Cytospora leucostoma</i>



thank
you