

Recent finding and control measures of branch canker, black streak and stem-end rot diseases of avocado

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Why do we call it Dothiorella canker?

- The fungus *Dothiorella gregaria* was isolated first time by Dr. Horne in 1934.
 - ▣ Later on the fungus was reclassified and named as *Botryopshaeria* (anamorph- *Neofusicoccum*)

Botryosphaeria spp. (Dothiorella)

Entophytes – Parasites - Saprophytes

DISEASES

- Leaf spots
- Fruit rots
- Dieback
- Perennial Cankers
 - Avocado
 - Citrus
 - Grapevine
 - Pistachio
 - Almond
 - Oak

HOSTS

- Woody perennial crops
- Ornamental plants
- Native and introduced forest trees
- Occasionally opportunistic human pathogens causing hypodermal, ocular or internal organ infections

Branch dieback symptoms



Cankered old pruning wound on avocado



Cankered old pruning wound on avocado



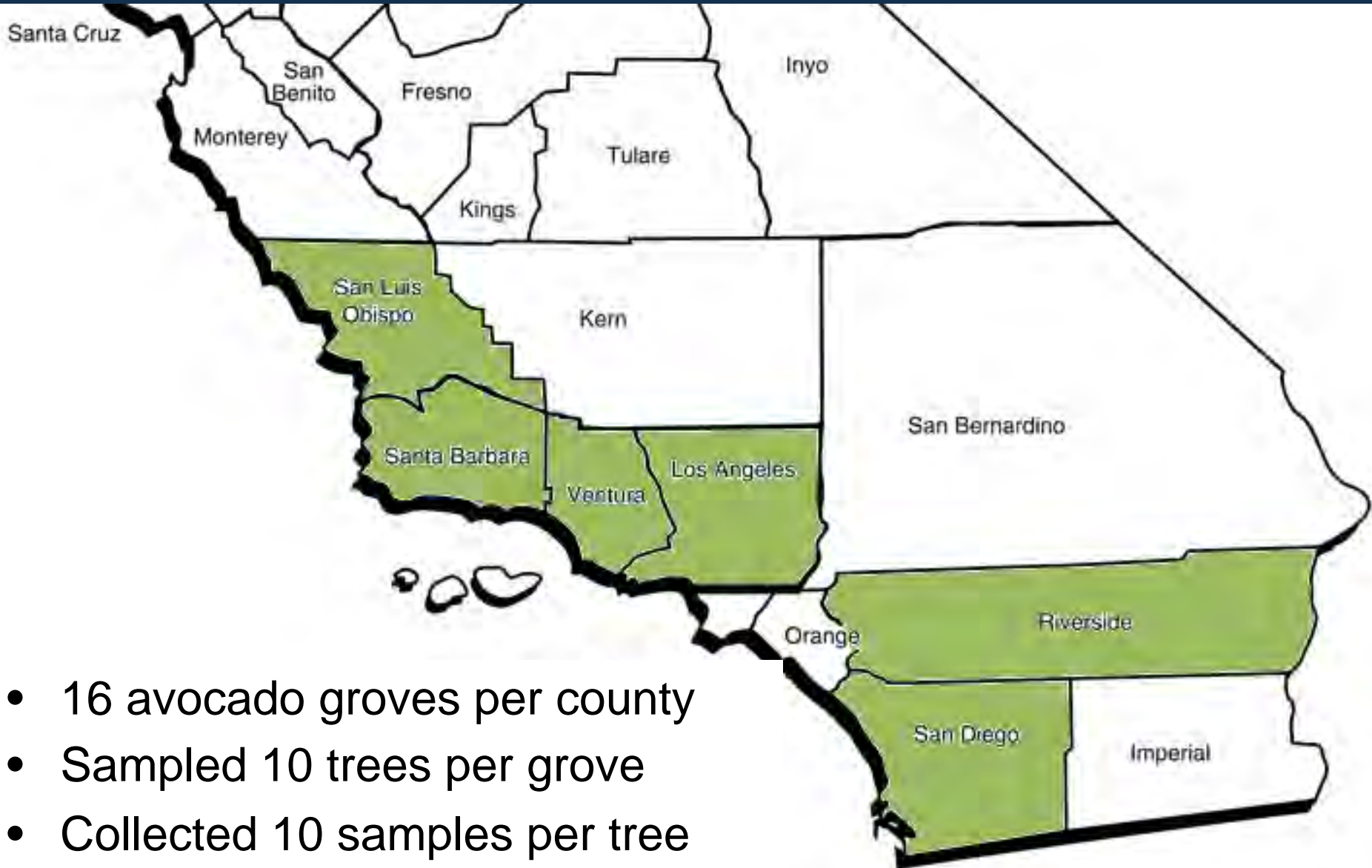
Cankered old pruning wound on avocado



Black Streak disease of avocado caused by *Botryosphaeria* spp.

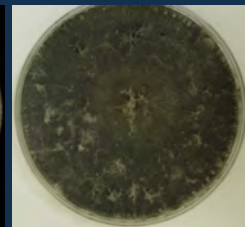
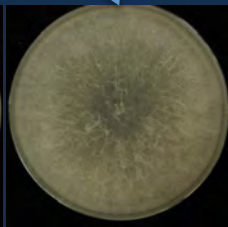


Survey on branch canker diseases



- 16 avocado groves per county
- Sampled 10 trees per grove
- Collected 10 samples per tree

Different branch canker symptoms on avocado



N. nonquaesetum

N. luteum

N. parvum

N. australe

N. vitifusiforme

D. iberica

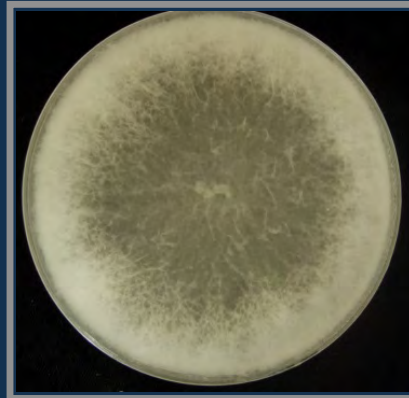
B. Dothidea
(*Dothiorella gregaria*)

Phomopsis sp.

Symptoms of Stem-end rot disease of avocado



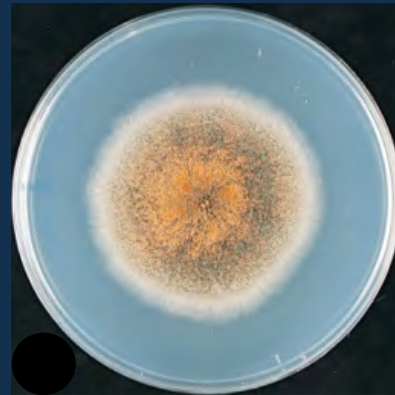
Stem-end rot



Neofusicoccum luteum

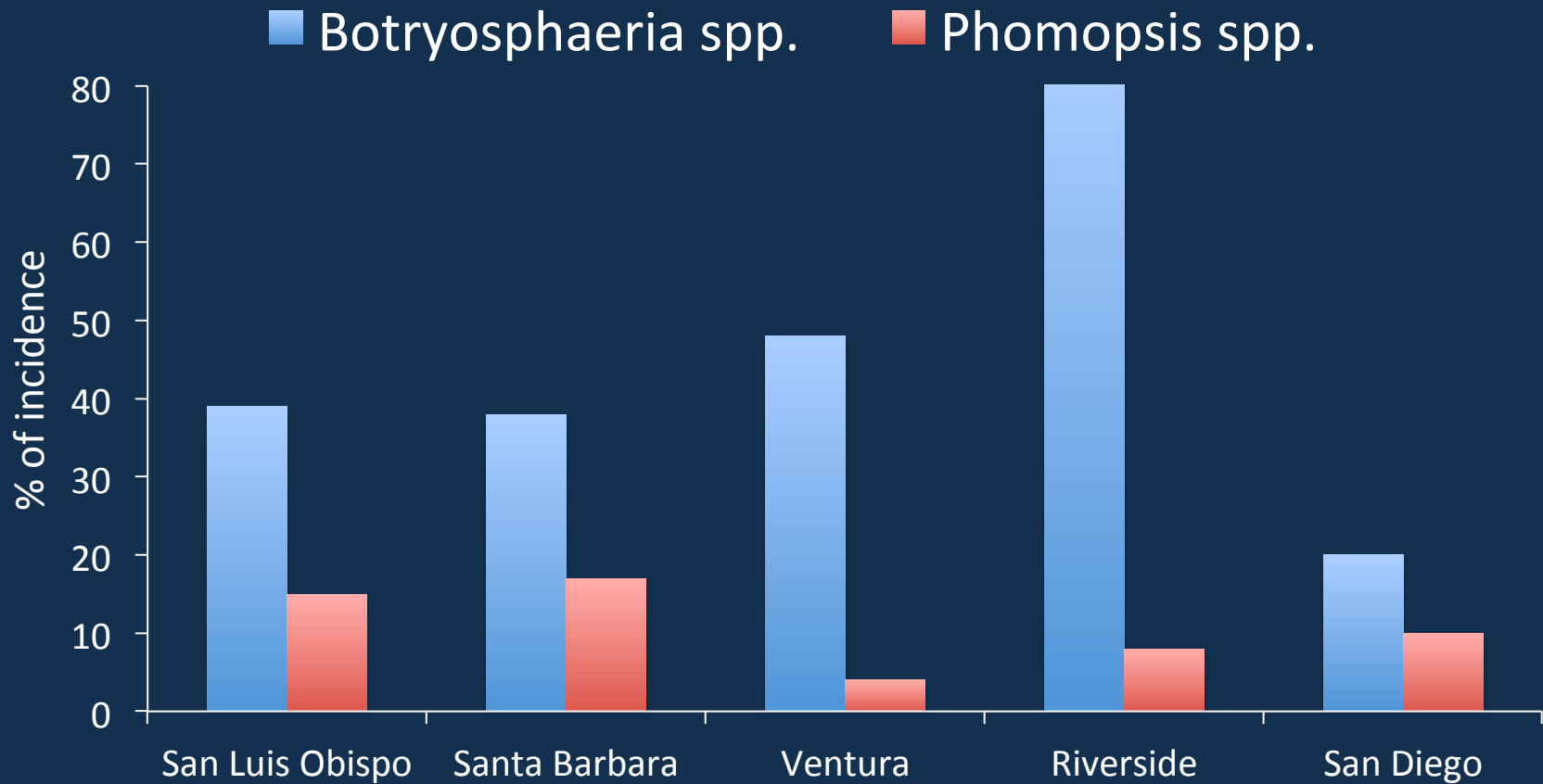


Phomopsis sp.



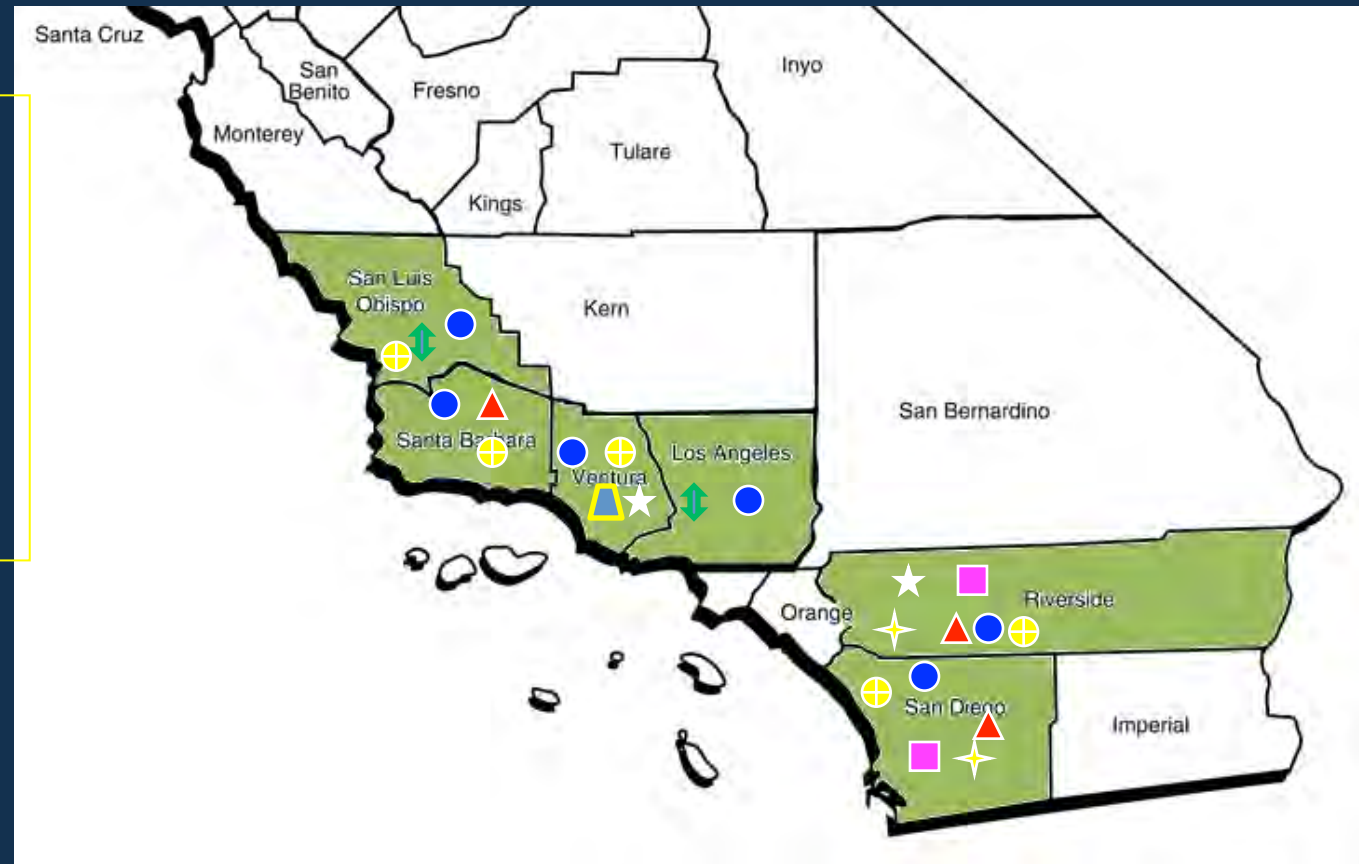
Colletotrichum gleosporioides

Incidence of *Botryosphaeria* and *Phomopsis* spp. in the main avocado production areas of California

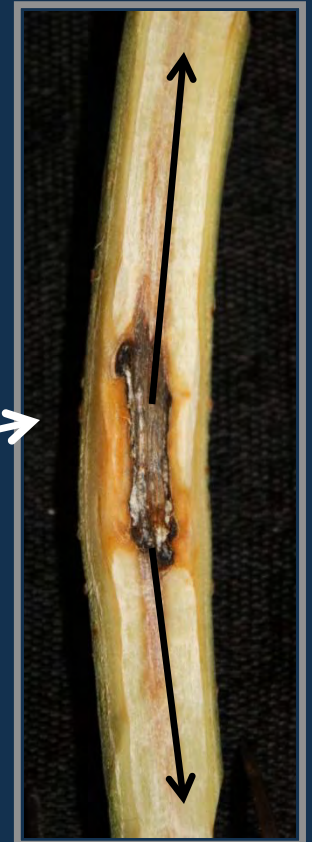
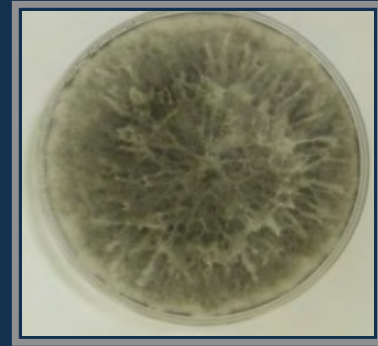


Geographical distribution of dothiorella branch canker of avocado in CA

- *Botryosphaeria lutea*
- ★ *Botryosphaeria australis*
- ▲ *Botryosphaeria parva*
- ⊕ *Botryosphaeria vitifusiforme*
- ✦ *Botryosphaeria rhodina*
- △ *Botryosphaeria dothidea*
- *Neofusicoccum mediterraneum*
- ↕ *Phomopsis* sp.



Pathogenicity Test



Koch's postulate in greenhouse



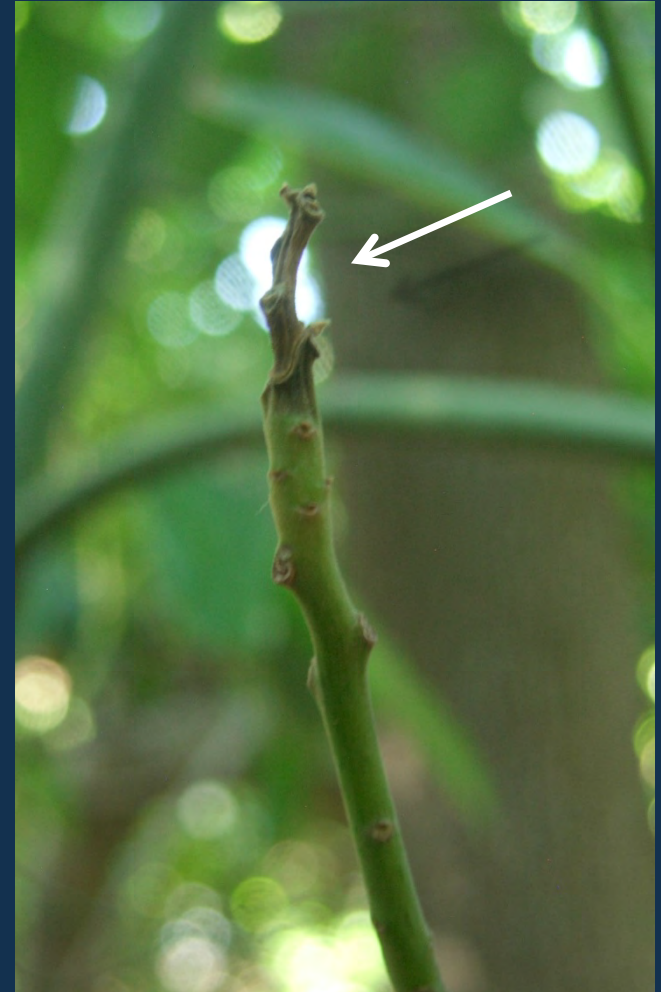
Control

1 week

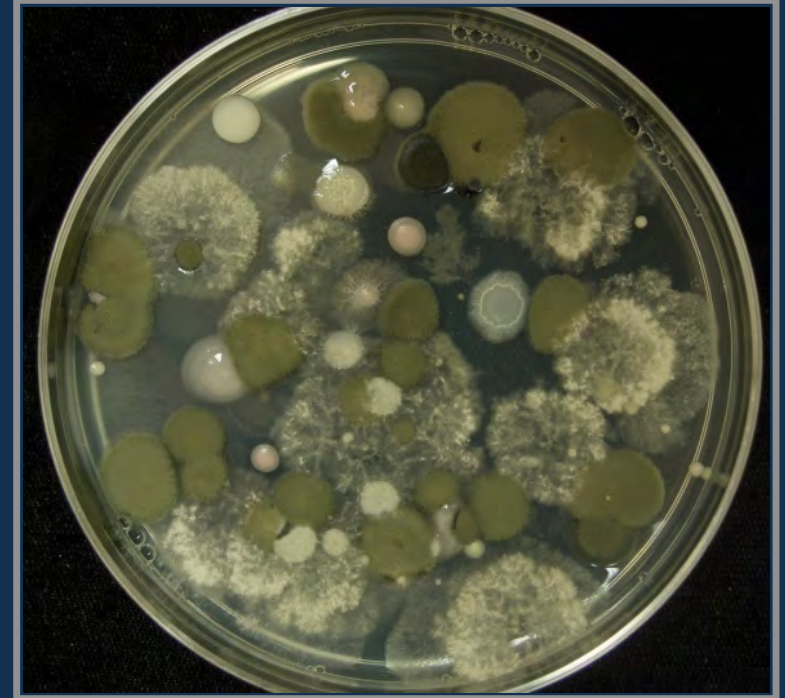
4 weeks

6 months

Leaf and twig symptoms



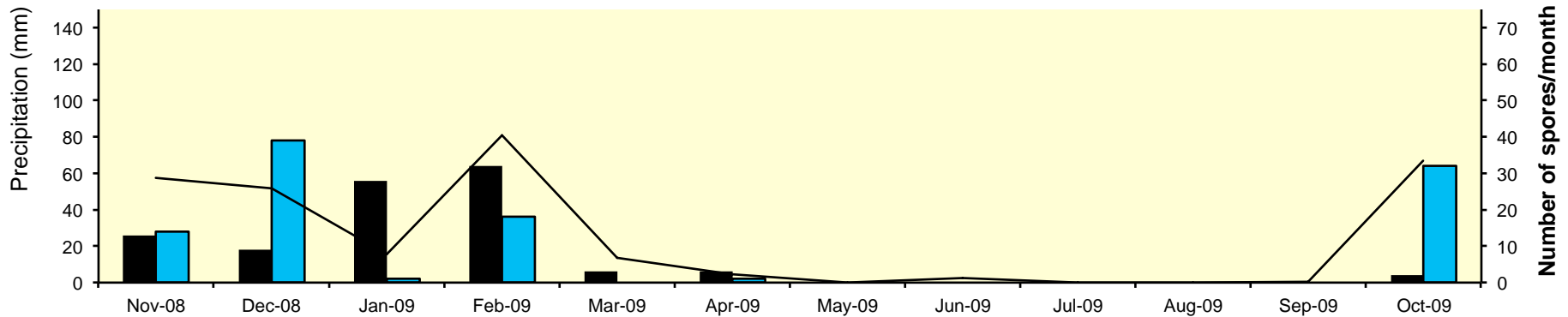
Spore trap study:



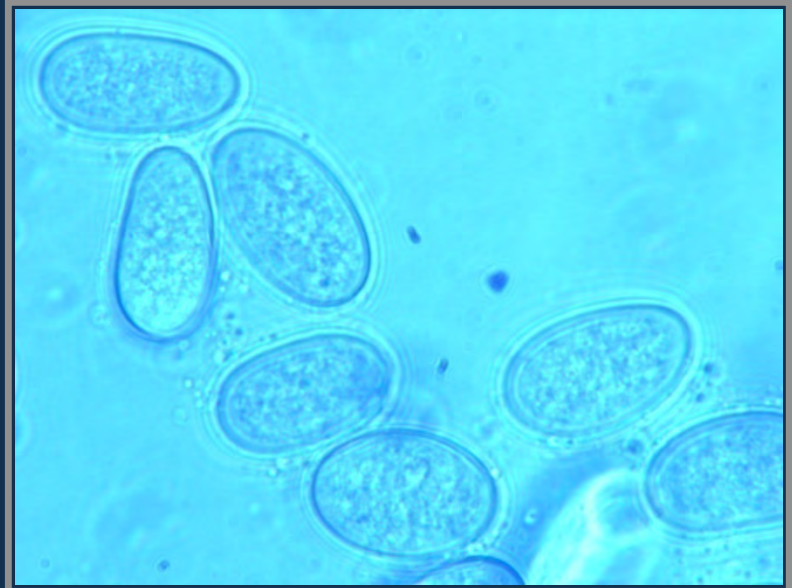
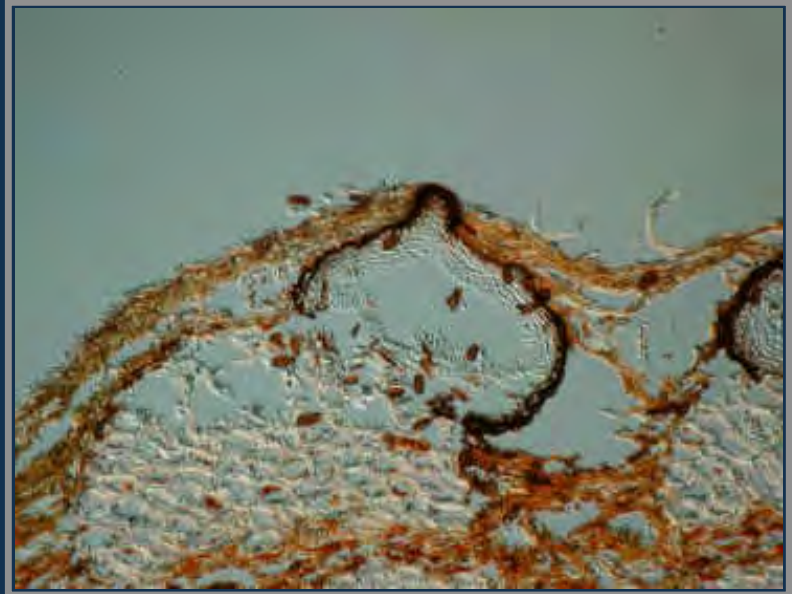
Spore trapping study

■ Botryosphaeria ■ Phomopsis — Precipitation

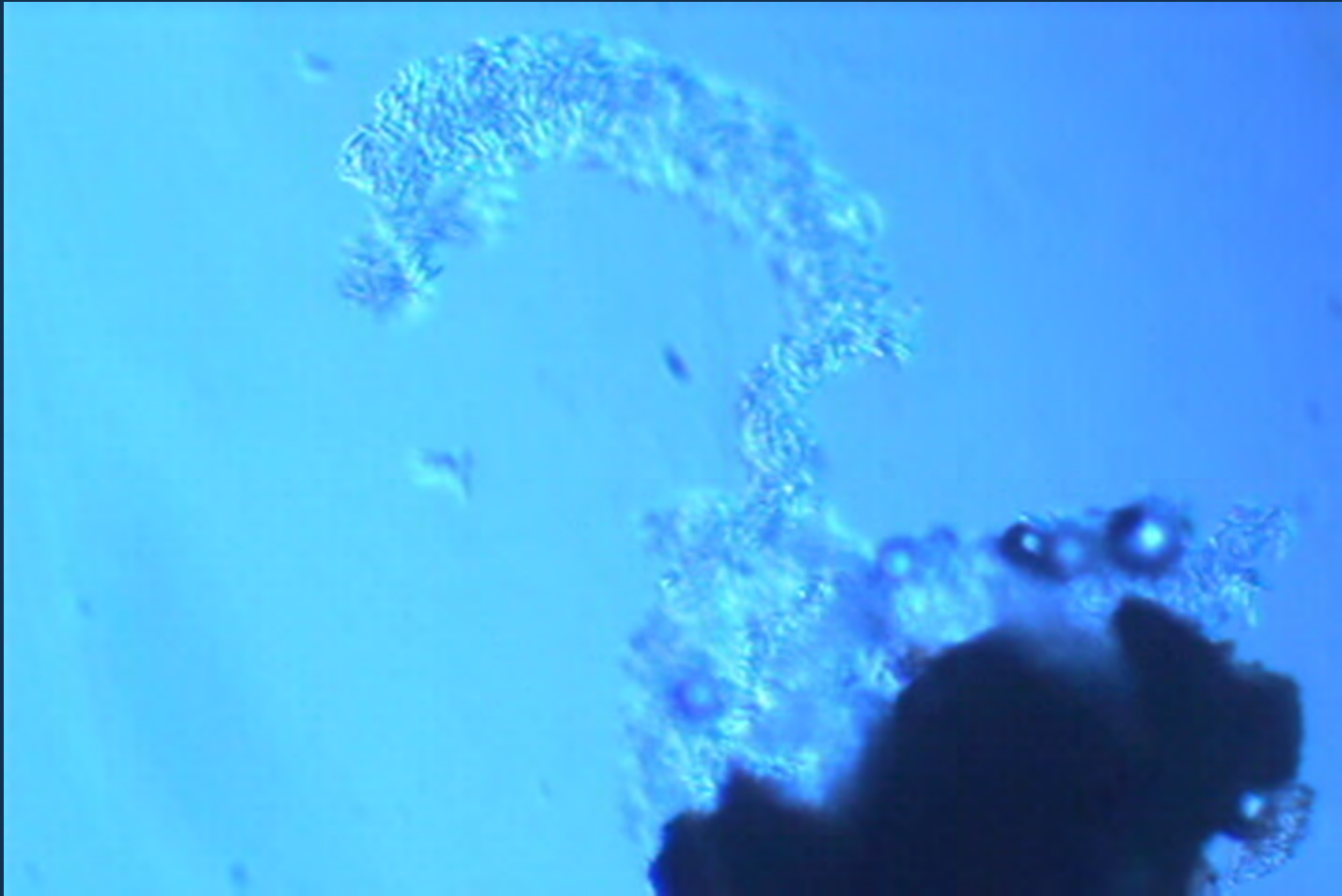
Ventura County



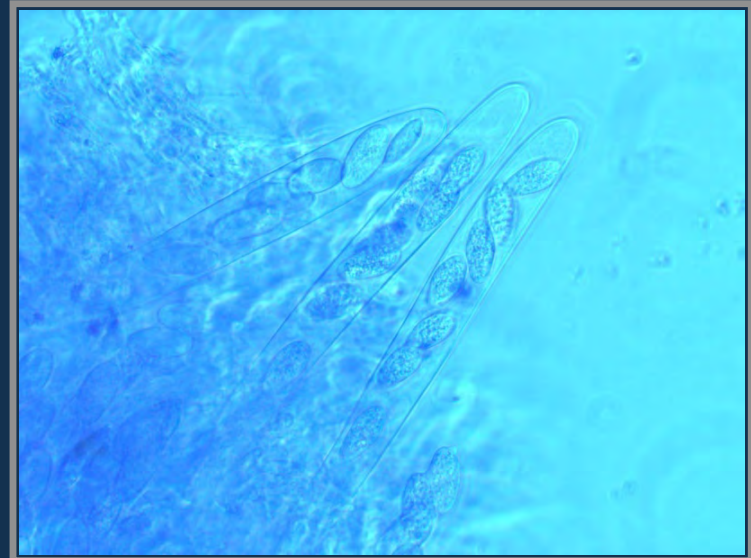
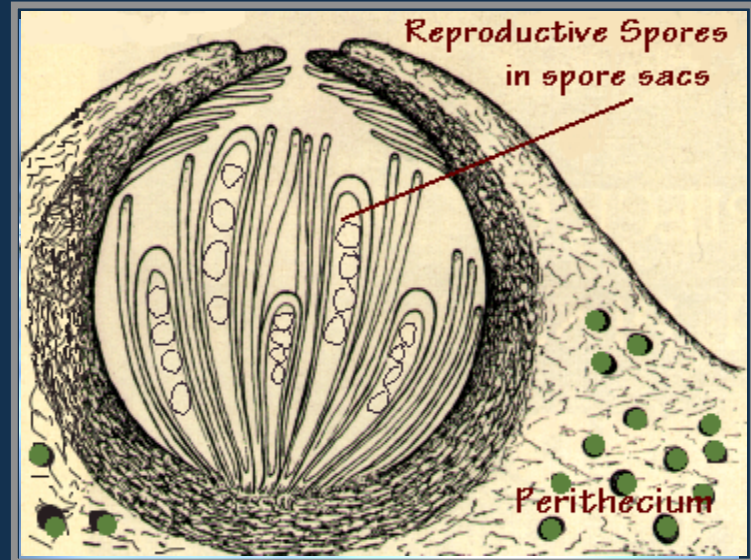
Pycnidia of fungi on dead branches of avocado



Spore release from pycnidia of Botryosphaeria



Perithecia were found on dead branches of avocado



Ascospore release from perithecia of Botryosphaeria



Effective concentrations for 50% reduction of mycelial growth (EC₅₀ values) of fungal

Fungicides	Concentrations applied (µg/ml)	EC ₅₀ values on fungal isolate ^a		
		<i>Dothiorella iberica</i>	<i>Neofusicoccum luteum</i>	<i>N. parvum</i>
Pyraclostrobin	100	0.010	0.008	0.012
Cyprodinil + Fludioxonil	100	0.013	0.012	0.024
Metconazole	100	0.020	0.014	0.010
Azoxystrobin + Propiconazole	100	0.033	0.052	0.006
Propiconazole	100	0.037	0.027	0.015
Trifloxystrobin	2000	0.237	0.149	0.199
Fenbuconazole	2000	0.330	0.402	0.462
Tebuconazole	60	-	0.016	0.010
Boscalid + pyraclostrobin)	2000	0.330	0.329	NI
Myclobutanil	2000	0.634	0.694	0.323
Thiophanate-methyl	2000	2.270	2.096	0.576
Pyrimethanil	3000	3.173	1.029	2.934
Aluminum tris	2000	NI ^c	NI	NI
Fluopyram	3000	NI	NI	NI
LSD ($\alpha = 0.05$) ^b		0.72	0.58	0.29

^a EC₅₀ values for inhibition of mycelial growth were determined using the spiral gradient dilution method.

^b Fisher's protected least significant difference test.

^c NI: Non inhibition (data were not used in statistical analysis).

Means internal and external lesion lengths (cm) recorded on avocado branches treated with different fungicides and inoculated with four fungi in the family of Botryosphaeriaceae or a *Phomopsis* sp.^a

Fungicide	Use rate (field)	Lesion length (cm)			
		Trial 1		Trial 2	
		Internal	External	Internal	External
Azoxystrobin + Propiconazole	17.5 oz/A	2.9 (44)	3.0 (28)	4.2 (58)	3.9 (57)
Metconazole	4 oz/A	2.9 (44)	2.7 (35)	4.9 (52)	4.3 (52)
Pyraclostrobin	16 oz/A	3.3 (37)	3.5 (14)	6.5 (36)	5.9 (35)
Cyprodinil + Fludioxonil	11 oz/A	4.0 (23)	3.4 (16)	6.8 (33)	6.5 (27)
Myclobutanil	4 oz/A	3.7 (29)	3.6 (11)	8.4 (17)	7.7 (14)
Water Control	-	5.2 (0)	4.1 (0)	10.2 (0)	8.9 (0)
LSD ($\alpha = 0.05$) ^b		1.9	ns	2.4	2.5

^a Means internal and external lesion lengths were averaged by fungal pathogens and timing of inoculation as there were no significant differences among fungal pathogens and between timing of inoculation; however, there were significant differences between both field trials. In parentheses are corresponding percent of inhibition.

^b Fisher's protected least significant difference test.

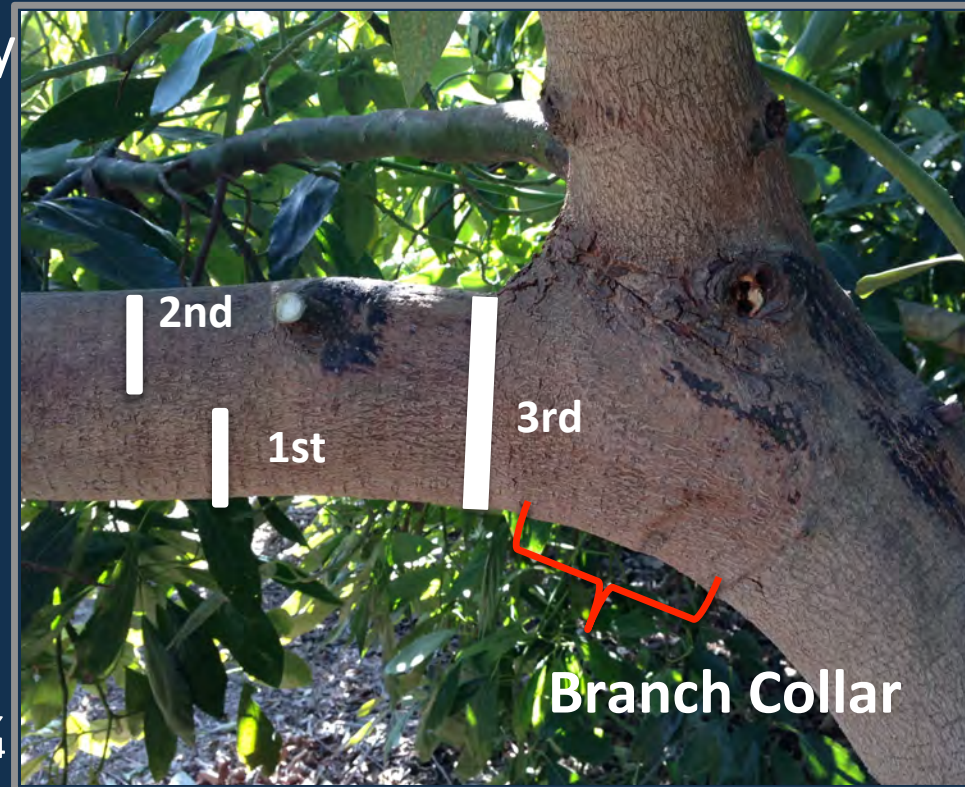
Best Management Practices of Pruning to Prevent Diseases on Trees

Three Cut Method:

1st cut: About one foot away from branch union with the trunk (crotch). Cut from under the branch approximately one-third to halfway through the branch.

2nd cut: Cut from above, approximately two inches past the first cut.

3rd cut: Cut at the proper pruning point, just outside the branch collar. Make the cut $\frac{1}{8}$ inch and $\frac{1}{4}$ inch beyond the branch collar for small branches and large branches respectively.



Pruning Method

1. Do not cut too far from branch collar
2. Never cut into the branch collar
3. Cuts on small branches should be perpendicular to the branch, not at a diagonal to minimize wound surface area

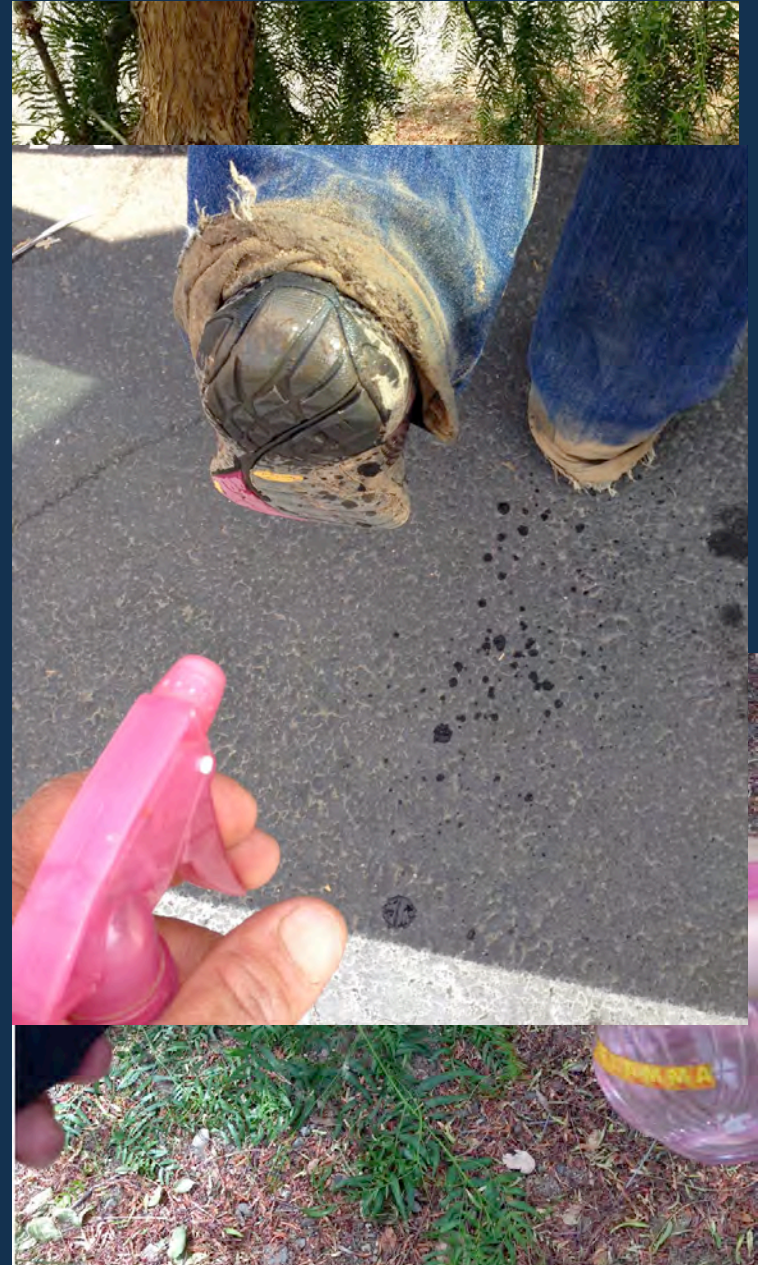


Do not use sealant on pruning wound



Recommended cultural practices to avoid infection

1. Avoid unnecessary pruning.
2. Harvest and prune only during dry conditions
3. Prune dead limbs and twigs that carry pycnidia and perithecia of fungi
4. Prior to pruning, spray or wipe the equipment with either
 - 50-100 % Lysol
 - 70% ethanol
 - 5-25 % Clorox
5. Never use disinfections on pruning wounds, as they could be phytotoxic
6. Prior to leaving a site, remove any accumulated soil/mud or plant debris from shoes and tires and spray with Lysol



Acknowledgement

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