University of California
Agriculture and Natural Resources

Managing Fungal Trunk Diseases in Plant Nursery Stock

California Fruit Tree, Nut Tree, and Grapevine
Improvement Advisory Board (IAB) and Stakeholders Meeting
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Rationale



- No state certification program for trunk disease (TD) pathogens.
- TD cause vine mortality in nurseries and vineyards.
- Growers have been cancelling orders when vines test positive for TD pathogens.

Project Overview

- CDFA-IAB – 2020-2025
  - Profile trunk disease pathogens from grapevine nurseries
  - Identify infection routes

- California Grape Rootstock Improvement Commission – 2024-Present
  - Evaluate the impact of stress on trunk disease outcomes
  - Improve sanitation practices

- USDA-NIFA Specialty Crop Research Initiative – Pending
  - Organize planning event with stakeholders to draft a full SCRI proposal
  - Multistate
  - Trans-disciplinary



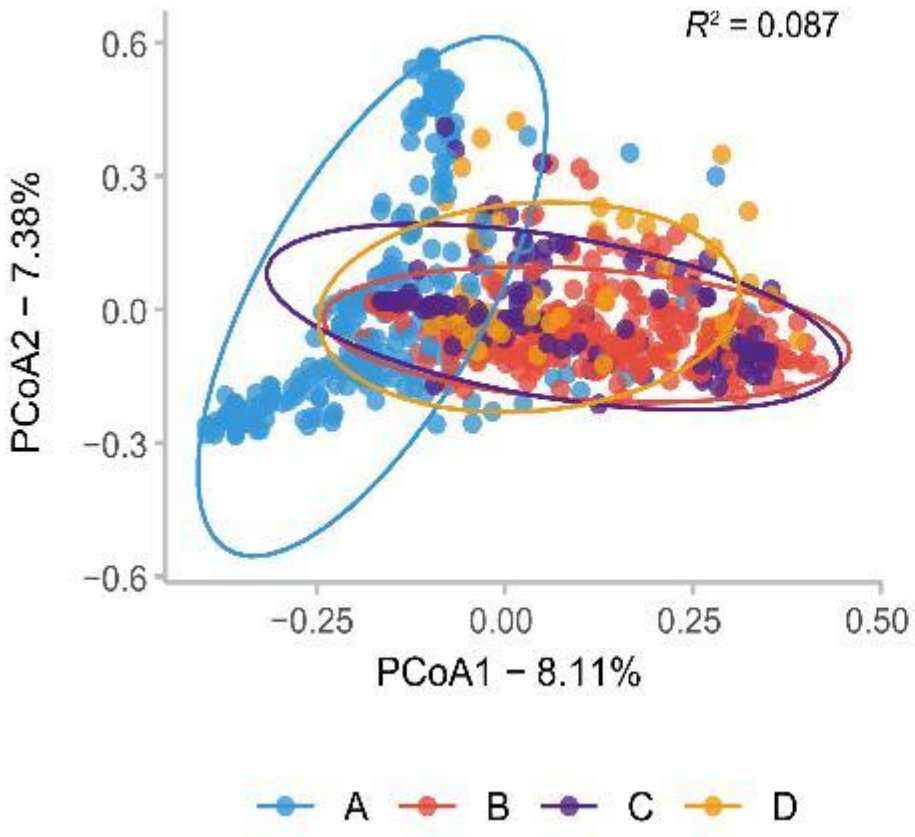


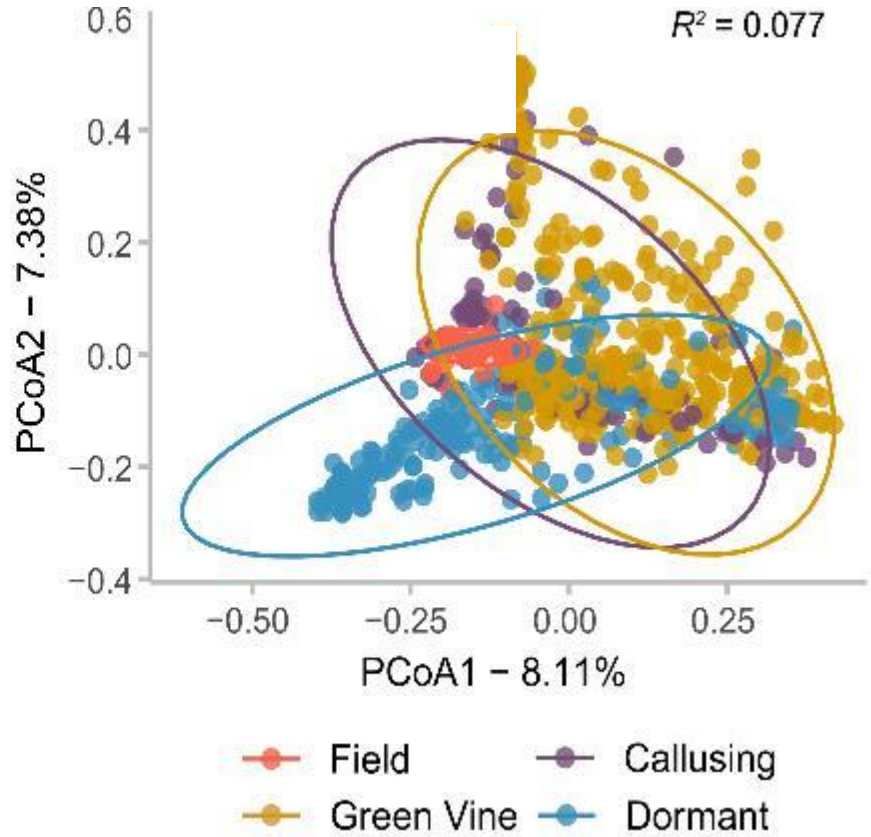


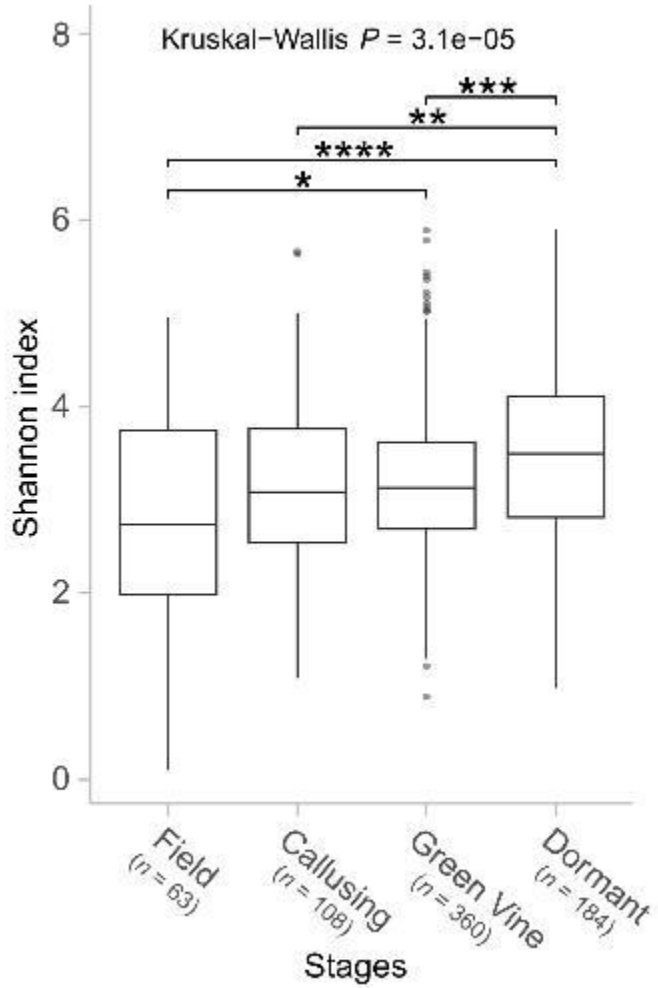





Nursery Origin and Propagation Stage Shape the Grapevine Microbial Communities



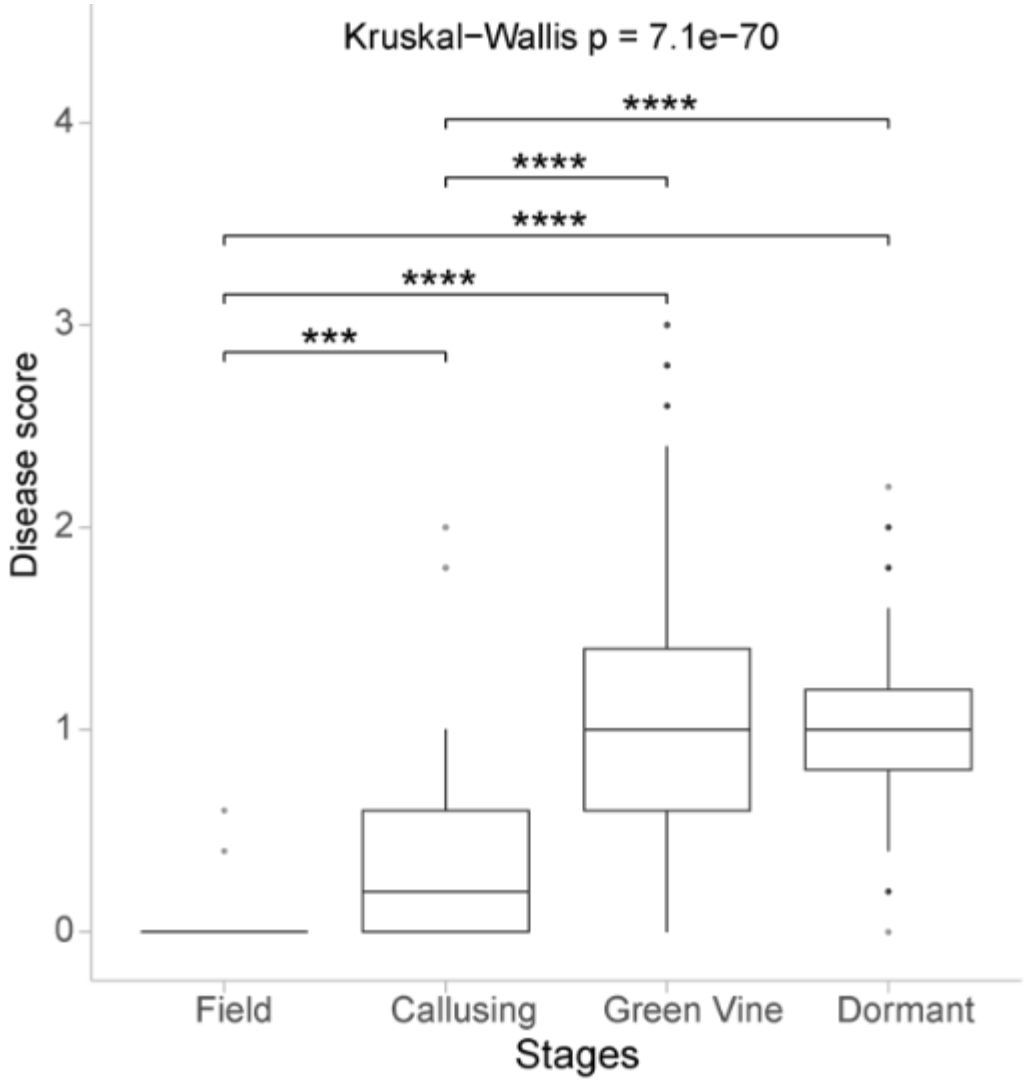




Microbial Composition

Microbial Diversity

Wood Health Decrease During Propagation





Pathobiome of Nursery Vines

	Lifestyle	Fungal genera	Percent incidence (n = 715*)	Relative abundance (n= 715*)	Isolation frequency (n=1509**)	
	Beneficial	*Trichoderma*	71.9	4.8	33.6	
Prevalent	Pathogenic	*Phaeoacremonium*	75.1	5.6	2.0	Young Vine Decline
Prevalent		*Pleurostoma*	42.6	0.8	0.9	Young Vine Decline
Prevalent		*Cadophora*	28.9	0.6	1.9	Young Vine Decline
Prevalent		*Phaeomoniella*	16.7	0.5	0.1	Young Vine Decline
Prevalent		*Fusarium*	91.3	14.5	22.1	Young Vine Decline
Prevalent		*Diaporthe*	23.5	0.2	0.3	Phomopsis Dieback
Rare		*Neofusicoccum*	9.5	0.1	0.1	Botryosphaeria Canker
Rare		*Diplodia*	6.4	0.01	0.1	Botryosphaeria Canker
Rare		*Botryosphaeria*	1.6	0.001	0.03	Botryosphaeria Canker
Rare		*Lasiodiplodia*	0.7	0.001	0.2	Botryosphaeria Canker
Rare		*Neoscytalidium*	0.7	0.002	0.03	Botryosphaeria Canker
Rare		*Dothiorella*	0.5	0.0001	0.0	Botryosphaeria Canker
Rare		*Eutypa*	7.8	0.1	0.0	Eutypa Dieback
		Cylindrocladiella	3.9	0.1	0.0	
		Campylocarpon	1.9	0.01	0.0	
		Dactylonectria	1.1	0.0004	0.0	Black Foot
		Ilyonectria	0.4	0.0004	0.03	Black Foot
		Neonectria	0.2	0.0002	0.0	Black Foot
		Pestalotiopsis	9.8	0.03	0.0	
		Truncatella,	1.3	0.0004	0.0	Others
		Rhizoctonia	N/A	N/A	5.3	Others



Increase of Trunk Pathogens Incidence During Propagation





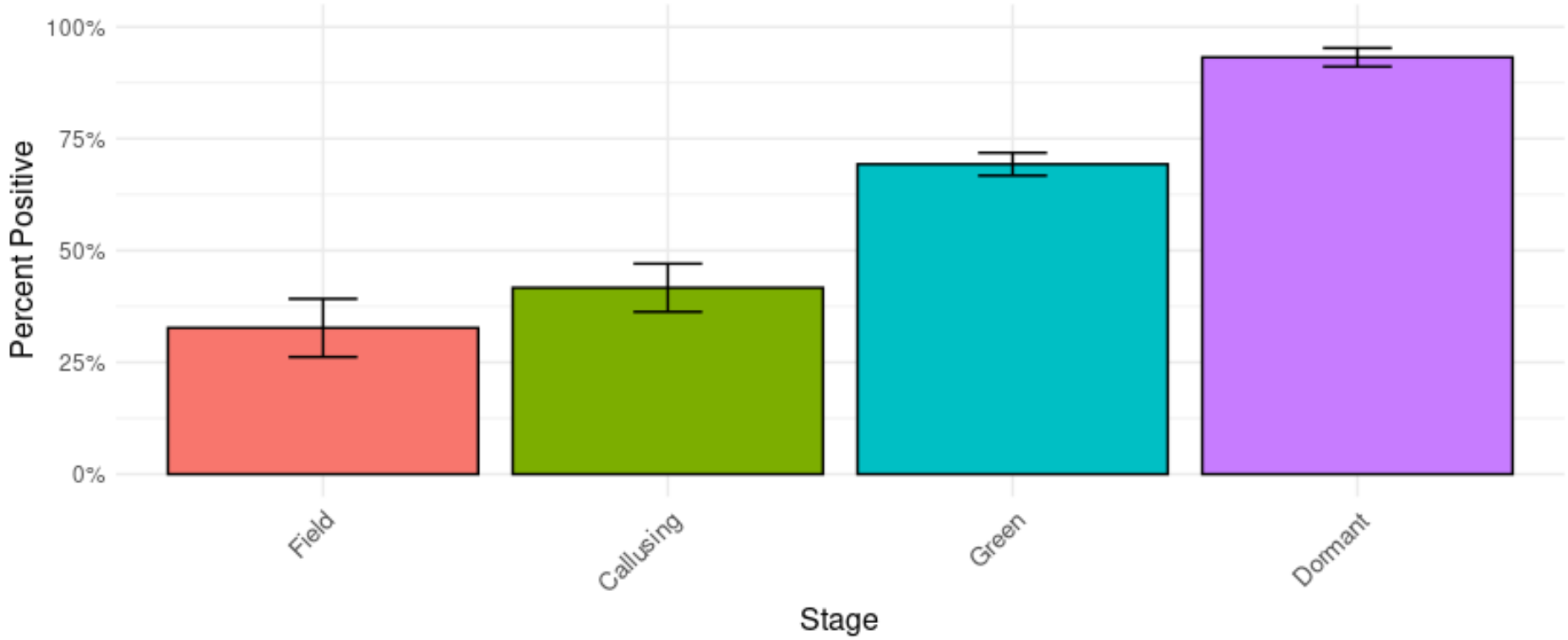


0 GTD-pathogen	11.1%	**28.6%**		0.3%	**6.1%**
1 GTD-pathogen	17.5%			5.8%	
2-4 GTD-pathogens	58.8%	**71.4%**		71.4%	**93.9%**
>4 GTD-pathogens	12.7%			22.5%	





Increase of Bacterial *Allorhizobium vitis* (Crown Gall) Incidence During Propagation



Percent Incidence of Pathogens in Environmental Samples

	Water Bath	Callusing Substrate	Potting Soil
			
A. vitis	62%	40%	30%
Fusarium	80%	75%	80%
Phaeoacremonium	55%	45%	55%

Managing Trunk Diseases in Nursery

A- Mother Blocks



- Implement same management practices recommended for commercial vineyards .
- Pruning wound protection with synthetic (thiophanate methyl) or biological (Trichoderma) fungicides.
- Apply fungicide on pruning wounds at vineyard establishment.
- Foliar spray to manage Botrytis and Phomopsis
- Fallow vineyard for 2 years before planting to lower latent nematode and crown gall infections.

Managing Trunk Diseases in Nursery

B- Water Tanks





- Hot water treatment (HWT) is state mandated regulation to prevent the spread of the invasive vine mealy bugs. Warm-up bath at 30°C (~90°F) for 5min, followed by mandatory treatment at 51 to 53°C (~127°F) for 5 min and a cool-down bath at 23°C (~72°F) or less.
- HWT does not kill crown gall and trunk disease pathogens.



Managing Trunk Diseases in Nursery

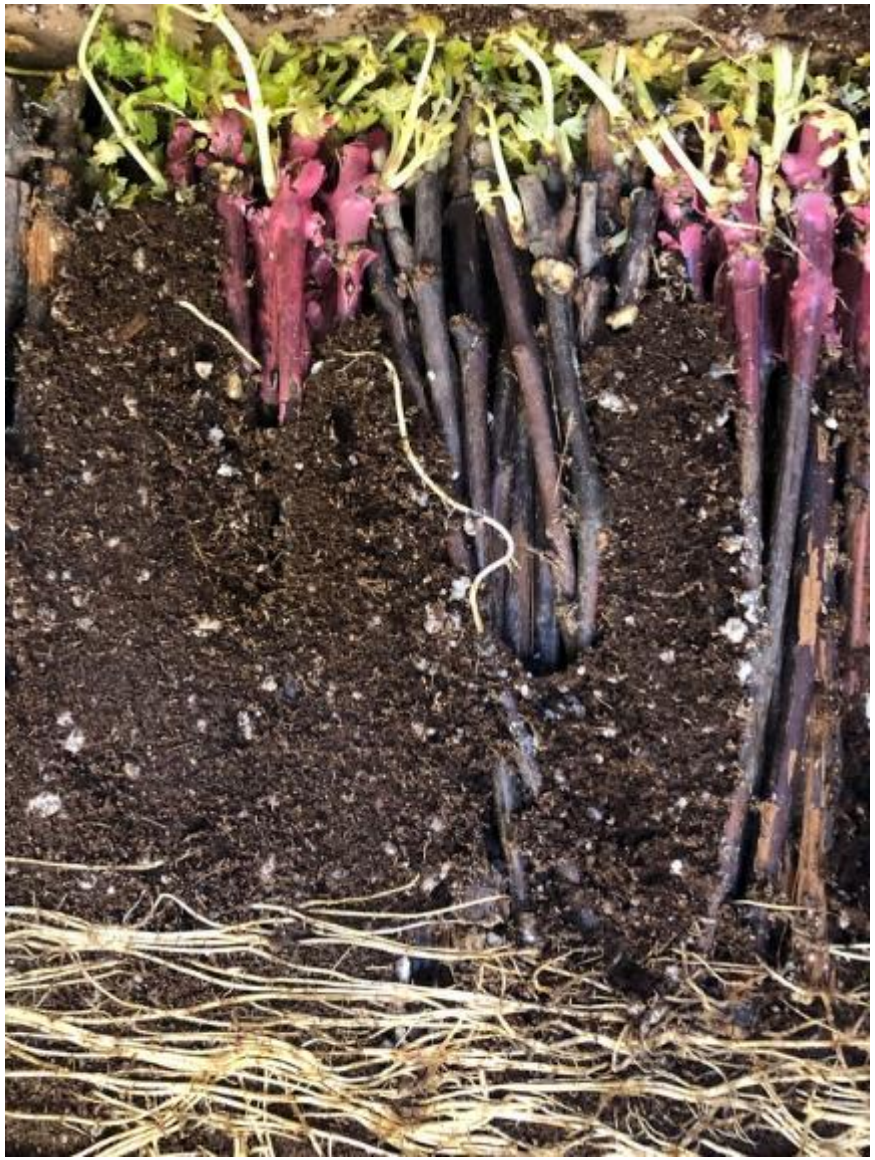
B- Water Tanks

- Replacing water often.
- Sanitation of water with ozone (O_3) or hypochlorous acid (HOCl) to avoid cross contamination with fungal and bacterial propagules.
- Avoid using water tanks for controlling mealy bugs and treat cuttings with phosphine gas.

Managing Trunk Diseases in Nursery

C- Soils





Methods for sanitizing soils that are effective and cost effective are not available.

Managing Trunk Diseases in Nursery

D- Cuttings



- Treat cuttings with to control trunk diseases and mold.
  - Fungicides including thiophanate-methyl and dicarboximide.
  - Disinfectant such as hypochlorous acid (HOCl)
  - Biofungicides
  - Ozone

Conclusions and Perspectives



- A certification program for trunk diseases is not realistic; publish standard protocol for grapevine nurseries ?

- Improve sanitation practices will reduce trunk disease incidence and increase nurseries economic benefits. It will also have a lasting impact on vineyards.
  - Decrease latent infection (protect pruning wounds)
  - Sanitize cuttings (fungicide, biologicals)
  - Manufacture the microbiome of planting stocks.
  - Treat water bath (ozone, hypochlorous acid) or adopt different management practice for mealy bugs.

- Pathogen presence in planting material ≠ young vine decline symptoms or vine death. It is stressed induced.

- Educate growers about best practices post-planting.



Acknowledgements

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cdfa



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