

Understanding the current etiology of Aspergillus Vine Canker and sour rot of table grapes in California

M.I. Bustamante¹, K.Elfar¹, M.Arrequin¹, J.Kuzmenko¹, T. Zaninovich¹, G. Zhuang², T.J. Michailides¹, Akif Eskalen¹

¹Plant Pathology Department, University of California, Davis

²UCCE Farm Advisor.

aeskalen@ucdavis.edu



10th Table Grape Symposium
November 28, 2023



California Agriculture

- California produces nearly half of U.S.-grown fruits, nuts, and vegetables.



Grapes Acreage in 2021

-Raisin 138,000 Acre (55,845 ha)

-Table grape 128,000 Acre (51,799 ha)

-Wine grape 615,000 Acre (248,881 ha)

Total \$5.54 billion industry

University of California Cooperative Extension

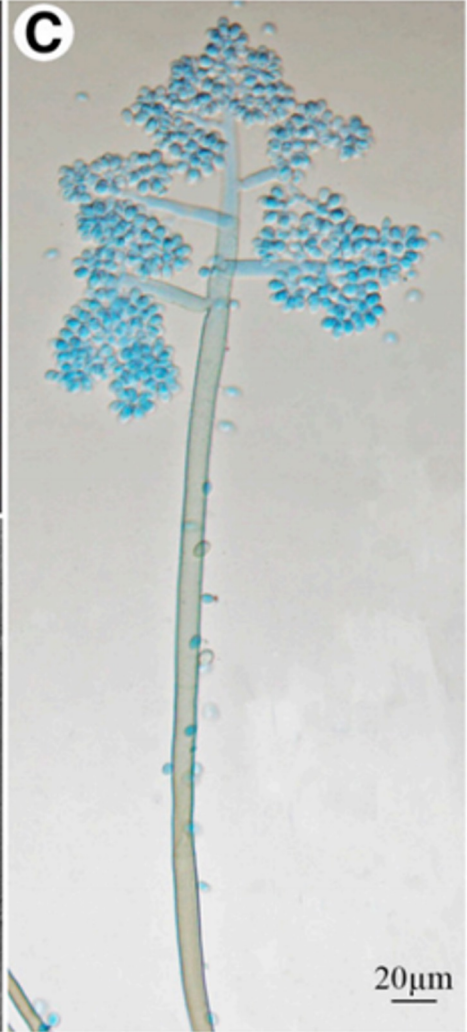
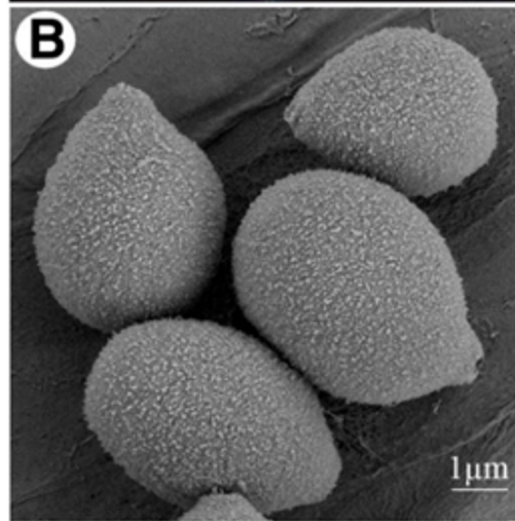


- The University of California has 10 campuses throughout California, including Cooperative Extension offices
- It is a network of UC researchers and educators who work together to develop and provide science-based information to farmers
- It is a network that was established more than 100 years ago. It worked very well back then and it has been working since.

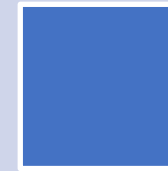
Pathogens involved with Bunch Rot / Gray Mold



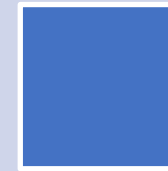
Botrytis cinerea



Fungus is ubiquitous



Attacks juvenile tissue,
ripe fruit Brix >8



After infection, the fungus
can produce sclerotia
(resting structure).

Summer bunch rot (Sour rot)

- In California, sour rot has been attributed to a complex of microorganisms including *Botrytis cinera*, *Aspergillus niger*, *A. carbonarius*, and others (Latham et al 2008)



Other common symptoms of sour rot



Background

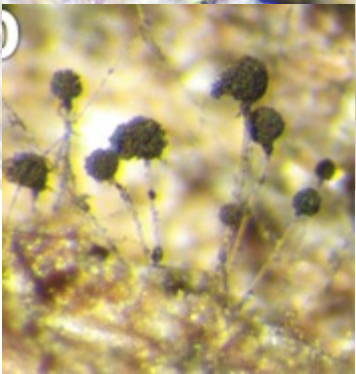
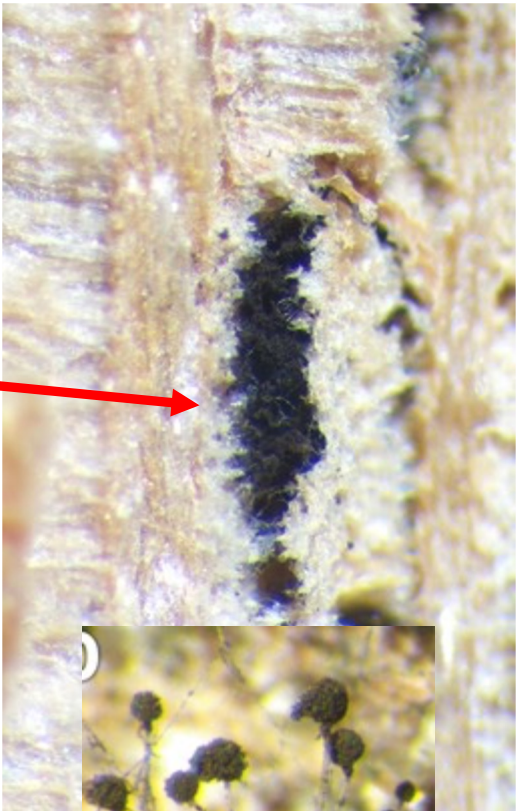
- An unusual wood canker disease was first detected in the San Joaquin Valley in 1989, affecting 'Red Globe' grapevines (Michailides et al. 2002).
- Since then, the disease has been observed on different cultivars, including Chardonnay, Grenache, and Crimson Seedless, and several table grape cultivars (Bustamante et al 2022, Vitale et al. 2008,2012, Hernandez-Martinez 2023).
- The pathogen was morphologically identified *Aspergillus niger*, a member of the group of black aspergilli, or *Aspergillus* section *Nigri*, and the disease was named as **Aspergillus Vine Canker**.

Unusual fall symptoms on virus free grapevines



Grenache cv./ Freedom

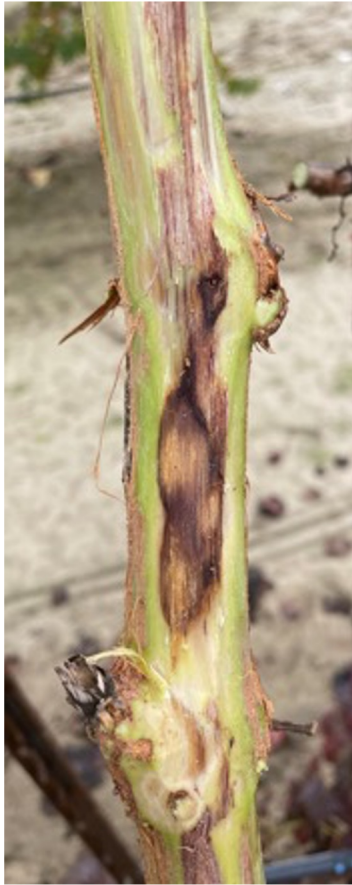
External Symptoms



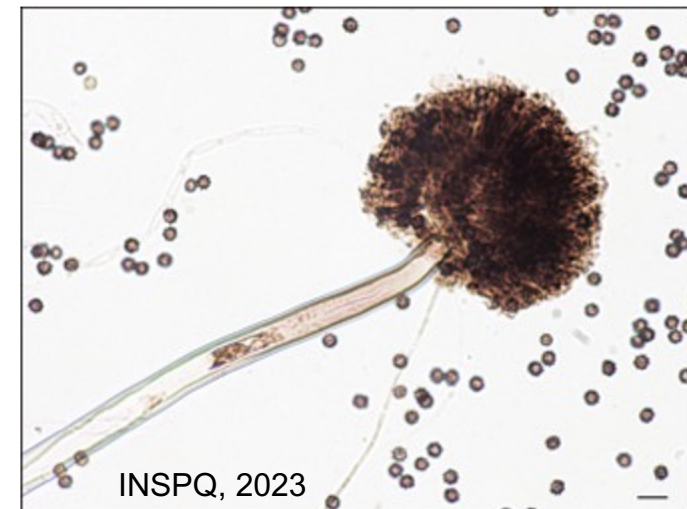
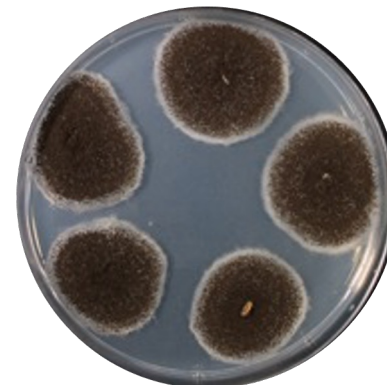
Internal symptoms:



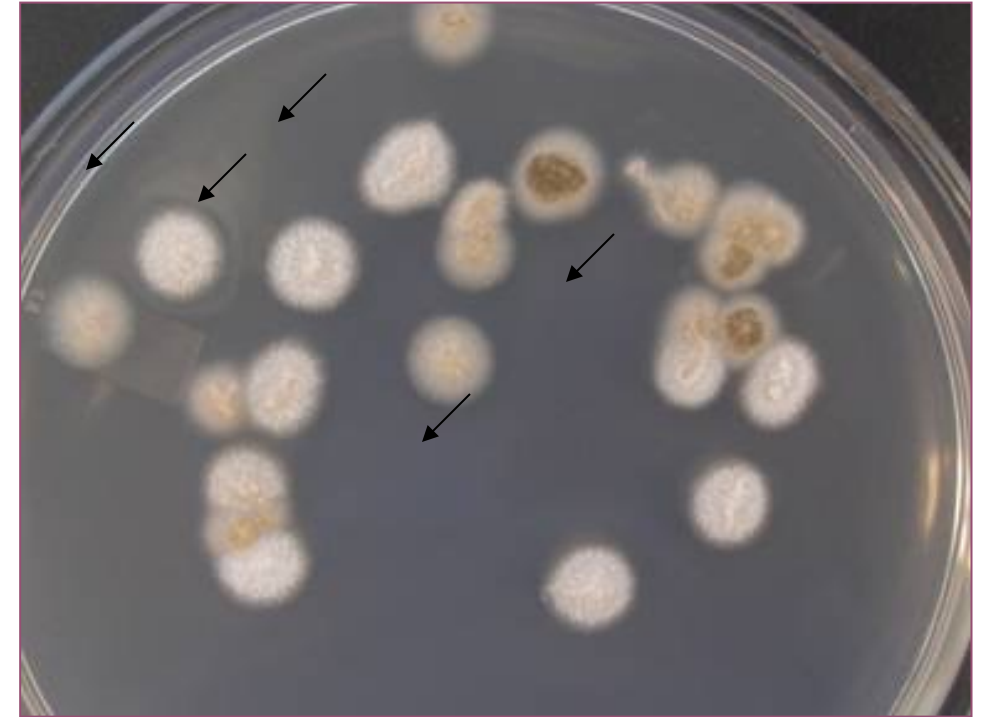
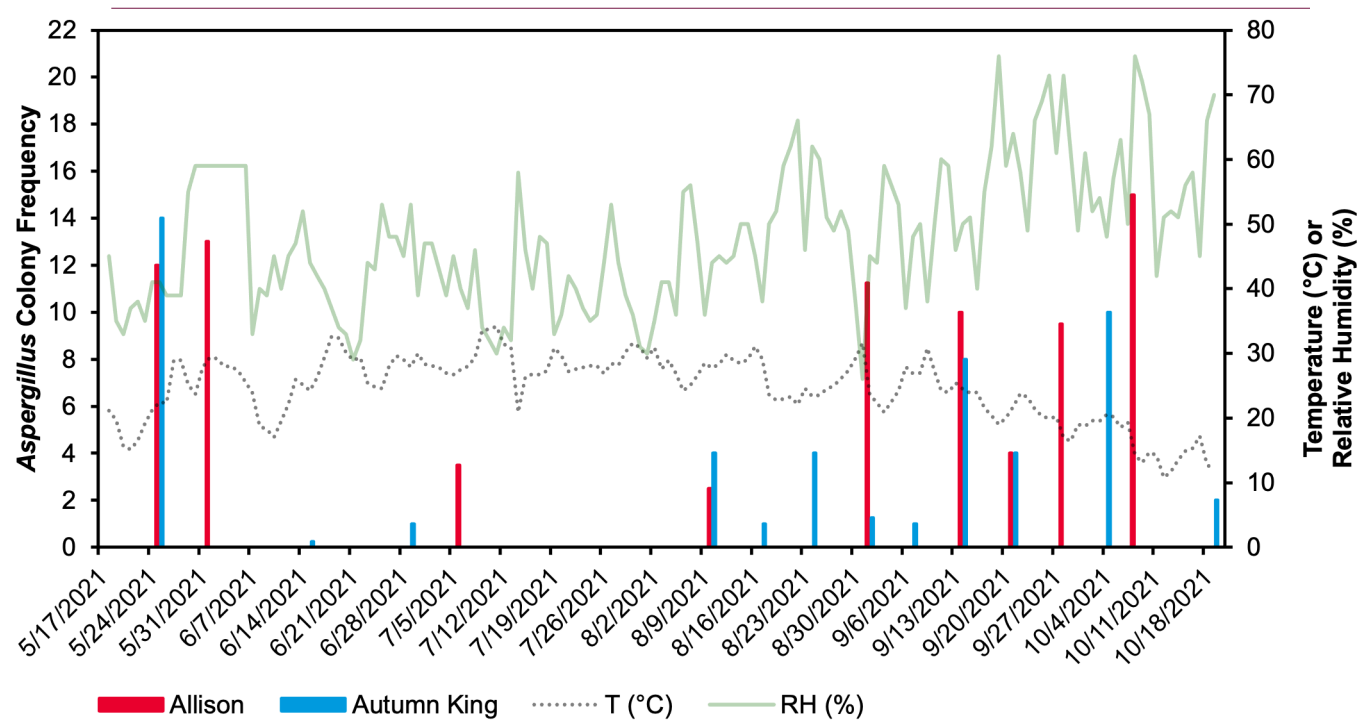
Survey of AVC- and SR-associated isolates



Origin	Number of isolates (<i>n</i>)
AVC samples 2021	10
AVC isolates 2000 (T. J. Michailides)	5
Sour Rot isolates	255
Spore trap isolates	20
Total	290



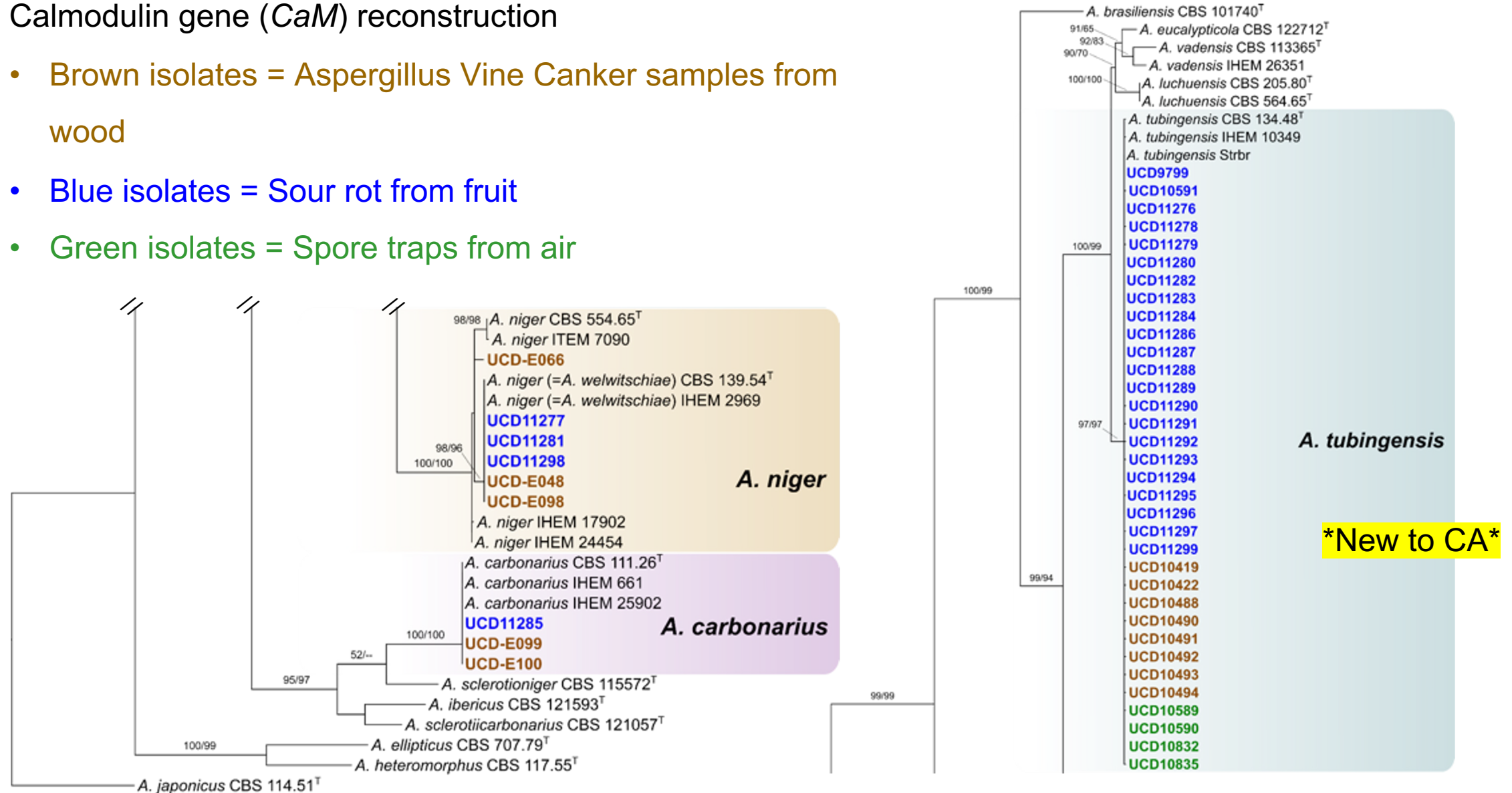
Spore dispersal pattern of summer bunch rot pathogens



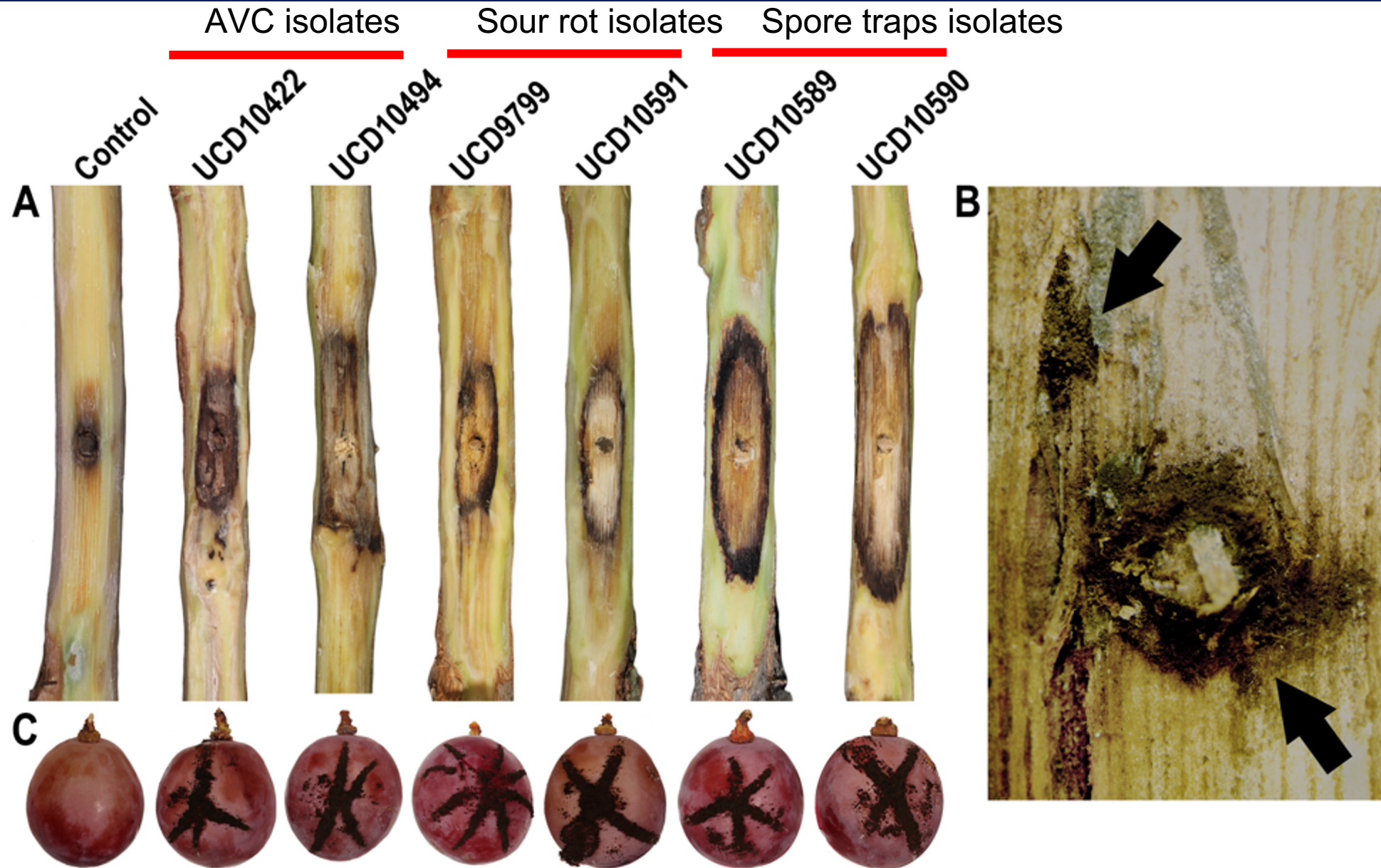
Identification of *Aspergillus* spp.

Calmodulin gene (*CaM*) reconstruction

- Brown isolates = *Aspergillus* Vine Canker samples from wood
- Blue isolates = Sour rot from fruit
- Green isolates = Spore traps from air

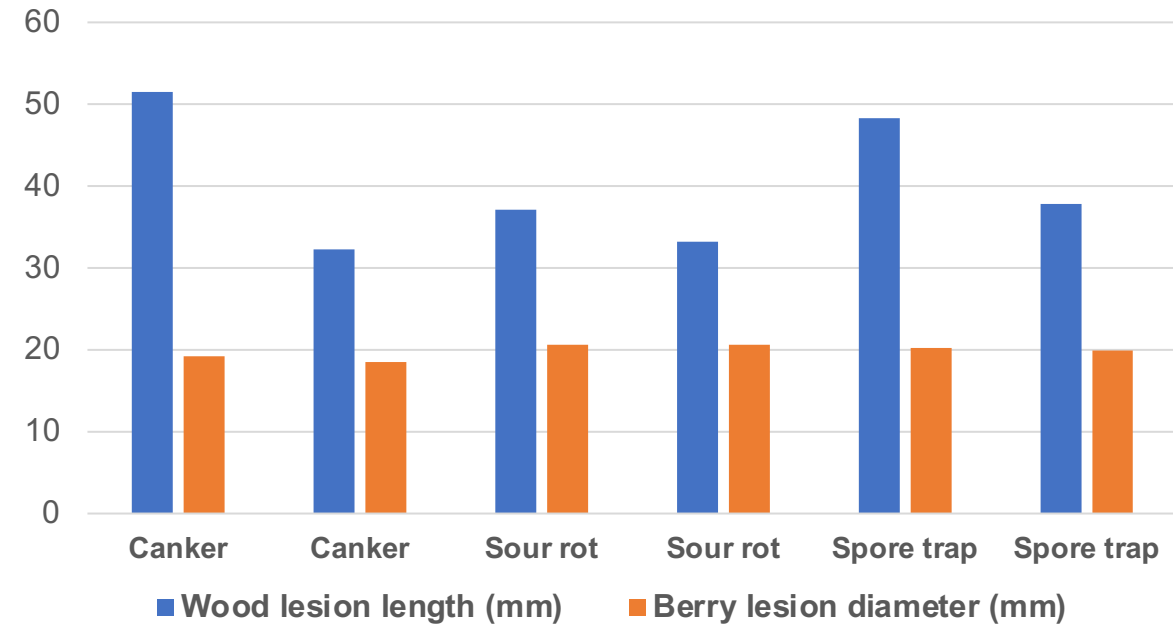


Pathogenicity of *Aspergillus tubingensis*



Pathogenicity of *Aspergillus tubingensis*

Isolate	Origin	Wood lesion length (mm)	Berry lesion diameter (mm)
UCD10422	Canker	51.5 a	19.2 abc
UCD10494	Canker	32.3 a	18.5 abc
UCD9799	Sour rot	37.1 a	20.6 a
UCD10591	Sour rot	33.2 a	20.6 a
UCD10589	Spore trap	48.3 a	20.2 ab
UCD10590	Spore trap	37.8 a	19.9 ab



Lesion length and diameter (mm) values obtained from pathogenicity tests in wood and ripen berries of 'Red Globe' grapevines.

Conclusion

1. The species *Aspergillus niger*, *A. carbonarius* and *A. tubingensis* are the causal agents of both cankers and sour rot of grapes in CA.
2. *A. tubingensis* is new to CA and is pathogenic in wood and berries regardless of the symptom they were recovered from.
3. The calmodulin gene sequences provides sufficient phylogenetic resolution to separate the 3 species.
4. Aspergillus Vine Canker is a canker disease affecting grapevines in CA and more studies are necessary to understand its epidemiology.

1 Reassessing the Etiology of *Aspergillus* Vine Canker and Sour Rot of 2 Table Grapes in California

3 Marcelo I. Bustamante¹, Karina Elfar¹, Janet Kuzmenko¹, Thomas Zaninovich¹, Molly Arreguin¹,
4 George Zhuang², Themis J. Michailides³, and Akif Eskalen¹

5 ¹Department of Plant Pathology, University of California, Davis, CA 95616

6 ²University of California Cooperative Extension, Fresno, CA 93710

7 ³University of California Davis and Kearney Agricultural Research and Extension Center, Parlier,
8 CA 93648

9 10 **Abstract**

11 Fungal taxonomy is in constant flux and the advent of reliable DNA barcodes has allowed to
12 improve the accuracy in the detection and identification of plant pathogens. In California,
13 *Aspergillus* Vine Canker (AVC) and Sour Rot (SR) are economically important diseases that affect
14 the wood and fruit of grapevines, respectively, and their causal agents are primarily species of
15 *Aspergillus* known as black aspergilli (*Aspergillus* section *Nigri*). During the last decade, the
16 taxonomy of these fungi has been rearranged several times using morphological, physiological
17 and genetic analyses, resulting in the incorporation of multiple cryptic species that are difficult to

Acknowledgments



- Malley Farms, Francisco Malley
- Dosanjh Bros. Paramjit Dosanjh
- Jeff Rasmussen, PCA
- Andrew Richards, Grad Student
- Maha Afifi



aeskalen@ucdavis.edu

<https://ucanr.edu/sites/eskalenlab/>