Red blotch virus: a brief overview of status in the foothills.

Lynn Wunderlich

UC Cooperative Extension Farm Advisor-Central Sierra

Foothill Grape Day ZOOM 4-1-20

Red blotch virus has been in California for a very long time. But it was “discovered” in 2013. Laboratory testing using “PCR” confirms.

Virology

Association of a DNA Virus with Grapevines Affected by Red Blotch Disease in California

Maher Al Rwahnih, Ashita Dave, Michael M. Anderson, Adib Rowhani, Jerry K. Uyemoto, and Mysore R. Sudarshana

First, second, and fourth authors: Department of Plant Pathology, third author: Department of Viticulture and Enology, and fifth and sixth authors: United States Department of Agriculture, University of California, One Shields Av., Davis 95616.
Accepted for publication 15 April 2013.

ABSTRACT

Al Rwahnih, M., Dave, A., Anderson, M. M., Rowhani, A., Uyemoto, J. K., and Sudarshana, M. R. 2013. Association of a DNA virus with grapevines affected by red blotch disease in California. Phytopathology 103:1069-1076.

In the Napa Valley of California, vineyards of ‘Cabernet Franc’ (CF) clone 214, ‘Cabernet Sauvignon’ clone 337, and ‘Zinfandel’ clone 1A (Z1A) with grapevines exhibiting foliar symptoms of red blotches, marginal reddening, and red veins that were accompanied by reduced sugar accumulation in fruit at harvest were initially suspected to be infected with leafroll-associated viruses. However, reverse-transcription polymerase chain reaction (PCR) tests were negative for all known leafroll-associated viruses, with the exception of *Grapevine leafroll-associated virus* 2 in Z1A. Metagenomic analysis of cDNA libraries obtained from double-stranded RNA enriched nucleic acid (NA) preparations from bark scrapings of dormant canes on an Illumina platform revealed sequences having a distant relationship with members of the family *Geminiviridae*. Sequencing of products obtained by PCR assays using overlapping primers and rolling circle amplification (RCA) confirmed the presence of a single circular genome of 3,206 nucleotides which was nearly identical to the genome of a recently reported Grapevine cabernet franc-associated virus found in declining grapevines in New York. We propose to call this virus “Grapevine red blotch-associated virus” (GRBaV) to describe its association with grapevine red blotch disease. Primers specific to GRBaV amplified a product of expected size (557 bp) from NA preparations obtained from petioles of several diseased source vines. Chip bud inoculations successfully transmitted GRBaV to test plants of CF, as confirmed by PCR analysis. This is the first report of a DNA virus associated with red blotch disease of grapevines in California.

Additional keywords: geminivirus, next-generation sequencing.

Fig. 1. Symptoms of grapevine red blotch disease on leaves of **A,** 'Cabernet Franc' clone 214 and **B,** 'Cabernet Sauvignon' clone 7 in fall. **C,** Red secondary and tertiary veins of a leaf from affected Cabernet Franc grapevine. **D,** Basal leaves on the shoots of a mature Cabernet Franc clone 214 grapevine showing red blotch symptoms in fall.

Red blotch testing 2013-2017. Not random-only vines with red blotch or red leaf symptoms.

Mysore “Sudhi” Sudarshana, USDA virologist

2013: 10 blocks tested, 29 samples
24/29 positive.

2014: 14 blocks tested, 25 samples
13/25 positive.

2015: 20 blocks tested, 39 samples
28/39 positive.

2017 (M. Al Rwahnih): 31 blocks tested, 59 samples.
41/59 positive.

Total tested: 106 positive/153 samples


Sample 18. Zinfandel.
Negative for GLRav-3,
Positive for Red Blotch.
L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020
09/20/2017

Syrah
Negative for
GLRaV-3
Positive for RB

L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020


Zinfandel Negative for leafroll, positive for Red Blotch. Dry farmed on own root.
L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

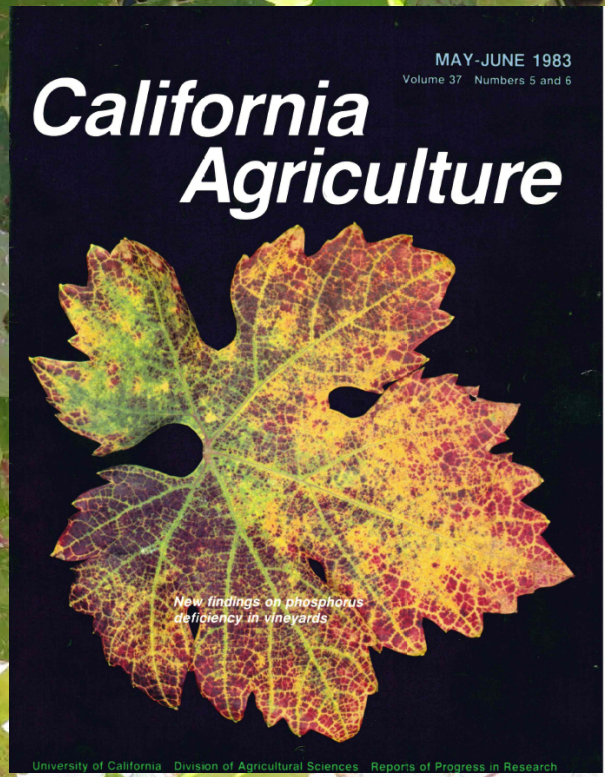
Cabernet sauvignon. Positive for GLRaV-3, **Negative for RB.**

Vermentino on 3309 planted 2005, positive for RBaV; Brix 22 at harvest (winemaker pleased)


L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020
09/25/2013

L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

Syrah-Mapped to Aiken/Cohasset
Red blotch GRBV Negative
Leafroll 3 Negative
Petioles at 0.3% P

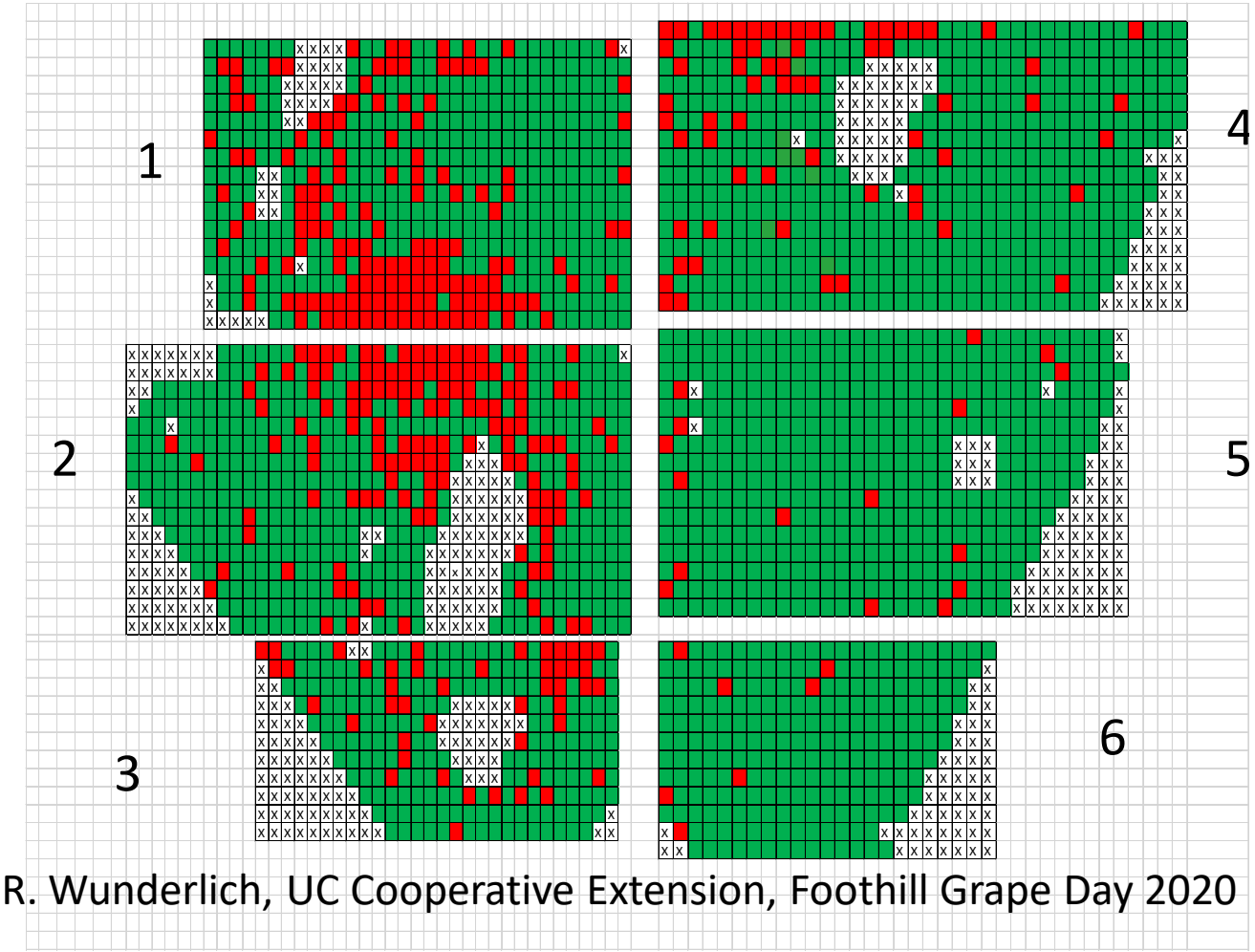


INVESTIGATING THE SPREAD AND EFFECT OF GRAPEVINE RED BLOTCH-ASSOCIATED VIRUS IN CALIFORNIA-GROWN ZINFANDEL

Lynn R. WUNDERLICH[1], Michael L. BOLLINGER[2], Meredith SHAFFER[3], Cindy R. PRETO[2], Brian BAHDER[4], Frank G. ZALOM[2] and Mysore SUDARSHANA[3]

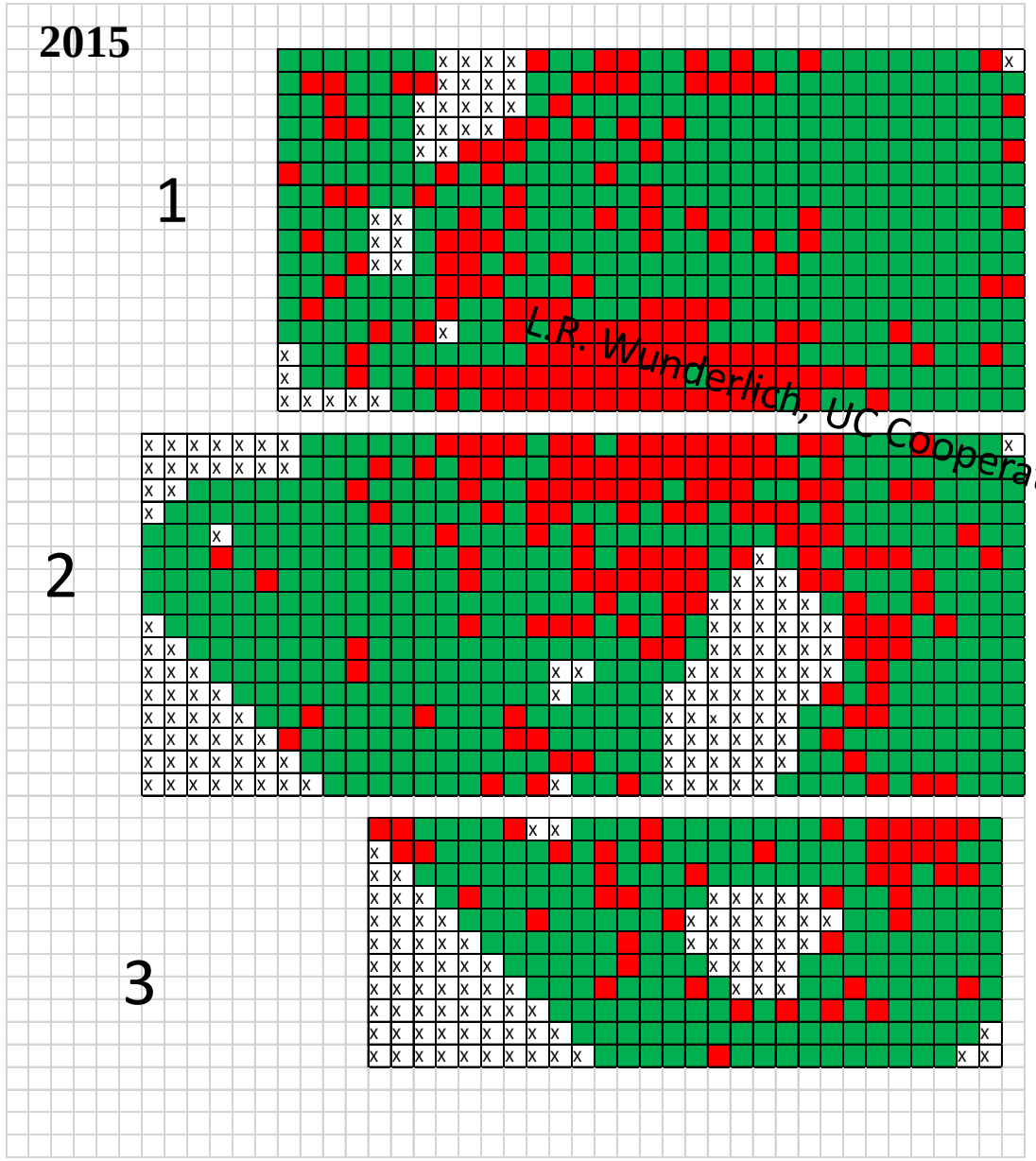
Amador Red Blotch Study Site: 2015 map. Own rooted Zinfandel-dry farmed.
Blocks 4, 5 and 6 were planted in 1987 with cuttings from a 1923 block located about ¼ N.

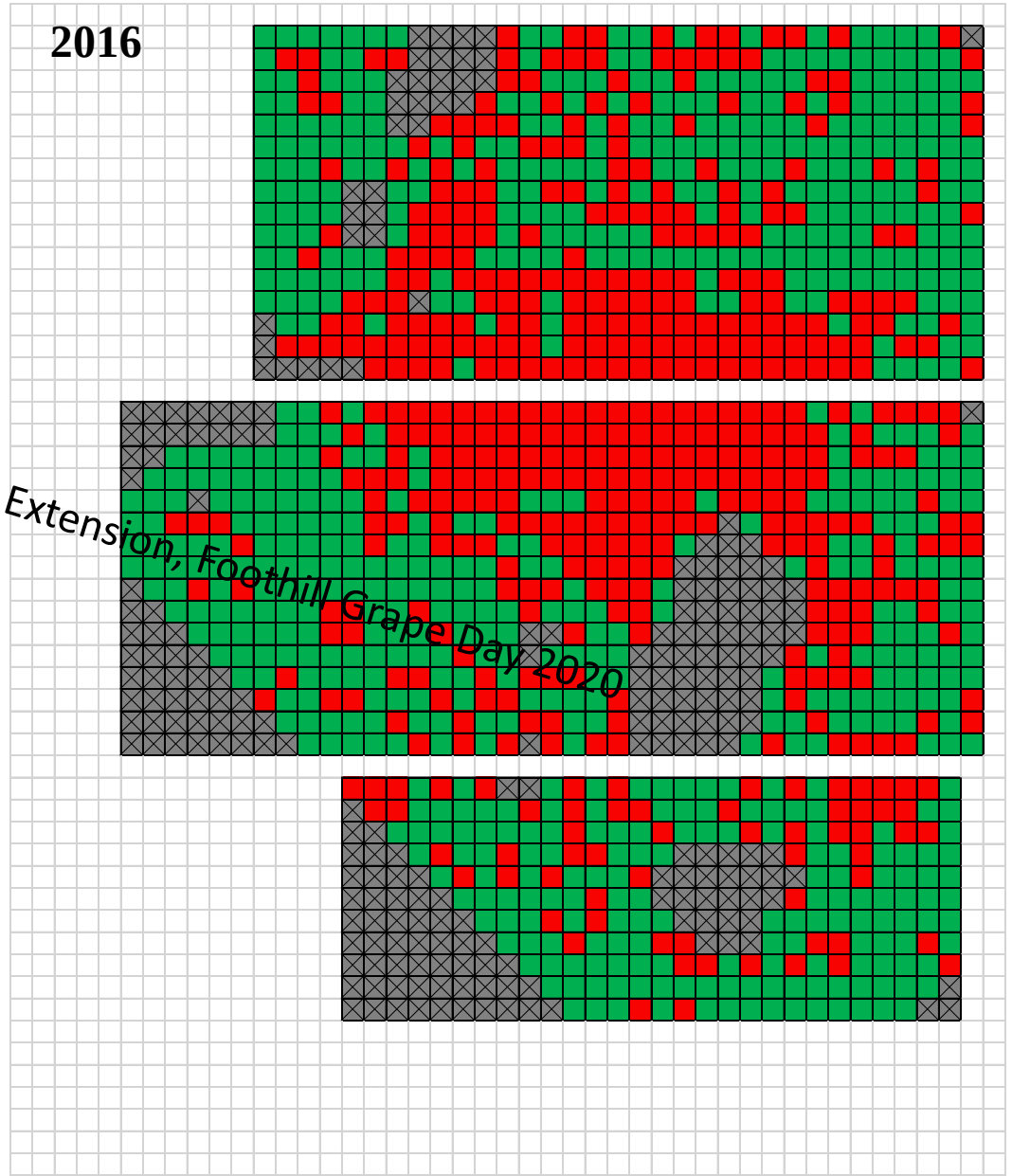
Blocks 1, 2 and 3 were planted in 1998 with cuttings from blocks 4-6.
Grower first started noticing symptoms in 2009.



L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

Overall red blotch infection in 2015 was rated 24.7%; and increases observed visually in 2016 were 18.2%, 19.9%, and 7.1% for blocks 1, 2 and 3, respectively.





L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

Three Cornered Alfalfa Treehopper (TCA)
Spissistilus festinus

FOOTHILL FODDER

Food for thought (Ag news) from a U.C. Cooperative Extension Farm Advisor in the Sierra foothills.

Bahder discovers Red Blotch vector!

SHARE | EMAIL | PRINT

Search Enter Search Terms

Subscribe

Enter e-mail Address

Recent Posts Blog Home

- Using the disease triangle and PMI to decide how to start your seasonal
- December 2016
- August 2016

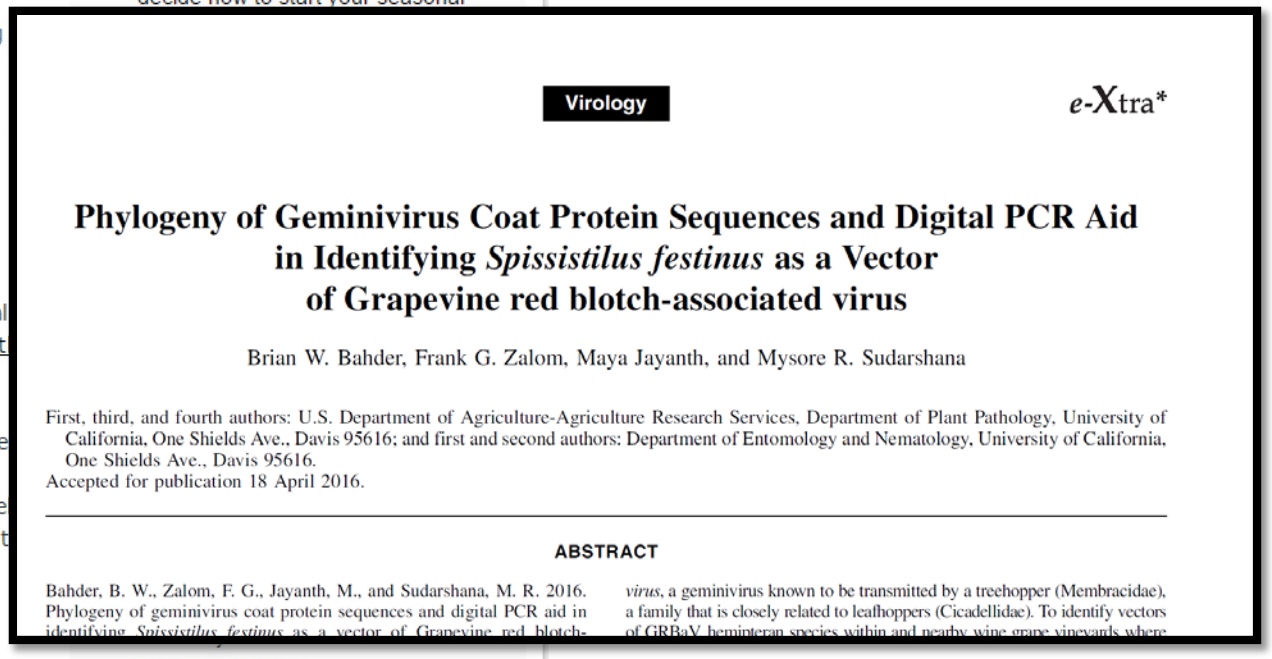
Author: Lynn Wunderlich

Published on: February 27, 2016

The 3 cornered alfalfa treehopper has been shown to transmit Red Blotch virus in greenhouse tests.

Brian Bahder, UC Davis Entomology post-doc, and Frank Zalom, UC Davis Entomology Professor, made an exciting revelation during the Feb. 26 Red Blotch Pest Alert webinar: they have confirmed the three-cornered alfalfa treehopper (*Spissistilus festinus*) as able to transmit Red Blotch Associated Virus (RBaV) to grapevines in greenhouse tests. **Their discovery is the first confirmation of a vector for RBaV.**

Badher and Zalom have been working as a team with Mysore "Sudhi" Sudarshana (USDA virologist) and several farm advisors and UC researchers, including Rhonda Smit (UCCE Sonoma), Mike Anderson (Oakville station) and myself, to monitor and map vineyards where patterns of red blotch spread are evident. Bahder narrowed the candidates of suspect vectors to those insects he found in common present in vineyards with pattern of red blotch spread from locations across the state. He then conducted arduous greenhouse tests consisting of rearing suspect vectors in complete virus free cages; placing them on RBaV infected vines, and moving them, a single insect per cage, ont virus-free vines to allow them to feed and possibly infect. He then used a highly sensitive PCR test, which allows detection of very small amounts of virus, to look for virus periodically in the vines after insect feeding. He found the virus in his greenhouse controlled vines that the three cornered alfalfa leafhopper had fed on **4 months after initial feeding** (and transmission) took place.



Virology

e-Xtra*

Phylogeny of Geminivirus Coat Protein Sequences and Digital PCR Aid in Identifying *Spissistilus festinus* as a Vector of Grapevine red blotch-associated virus

Brian W. Bahder, Frank G. Zalom, Maya Jayanth, and Mysore R. Sudarshana

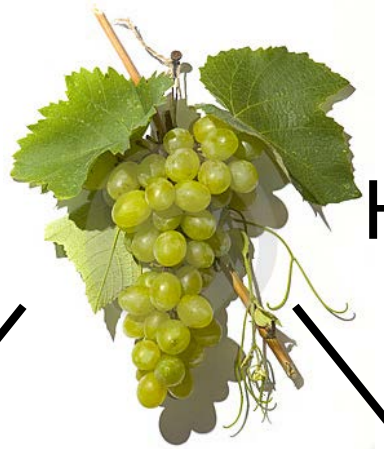
First, third, and fourth authors: U.S. Department of Agriculture-Agriculture Research Services, Department of Plant Pathology, University of California, One Shields Ave., Davis 95616; and first and second authors: Department of Entomology and Nematology, University of California, One Shields Ave., Davis 95616.
Accepted for publication 18 April 2016.

ABSTRACT

Bahder, B. W., Zalom, F. G., Jayanth, M., and Sudarshana, M. R. 2016. Phylogeny of geminivirus coat protein sequences and digital PCR aid in identifying *Spissistilus festinus* as a vector of Grapevine red blotch-*virus*, a geminivirus known to be transmitted by a treehopper (Membracidae), a family that is closely related to leafhoppers (Cicadellidae). To identify vectors of GRBaV hemipteran species within and nearby wine grape vineyards where

However, no other researcher has been able to replicate this work…yet…

Grapevine Red Blotch Associated Virus (GRBaV)

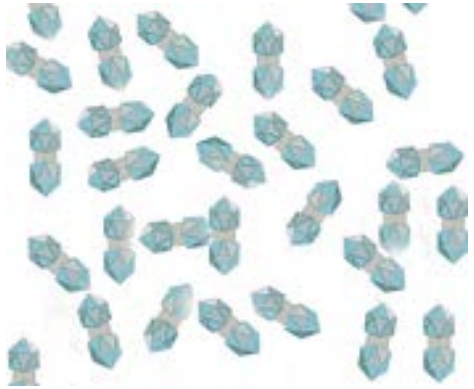


Host

Environment

Vector

Virus



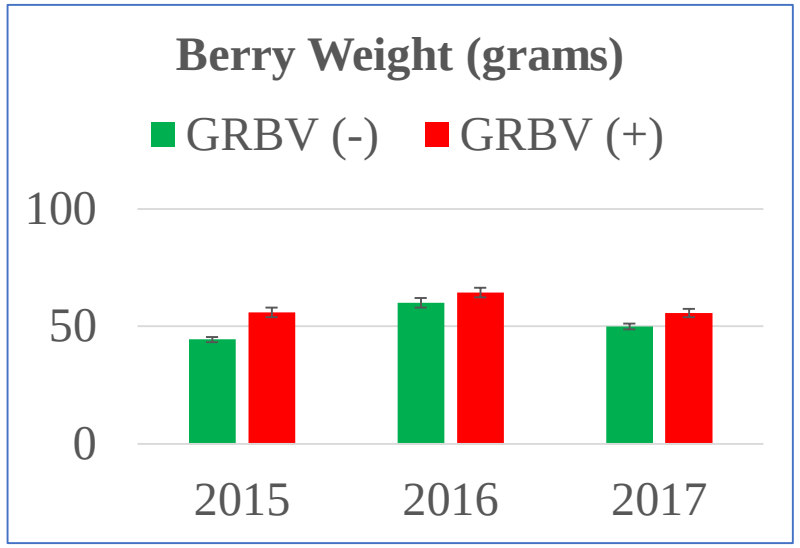
Strains or variants?

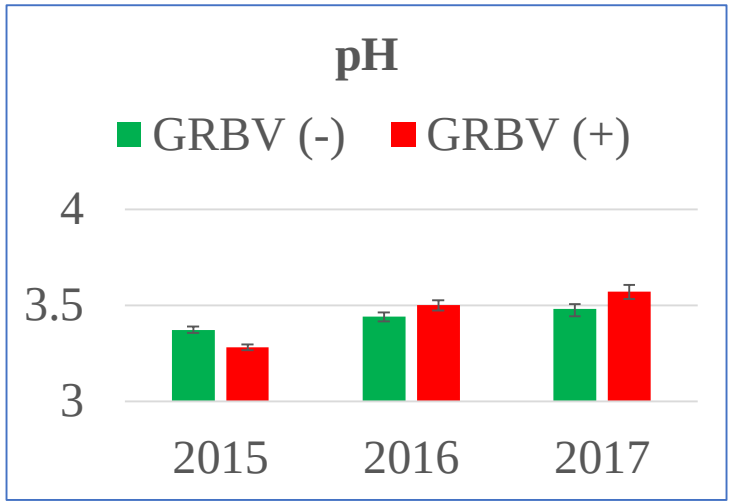
By Dr Graham Beards - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=21565938

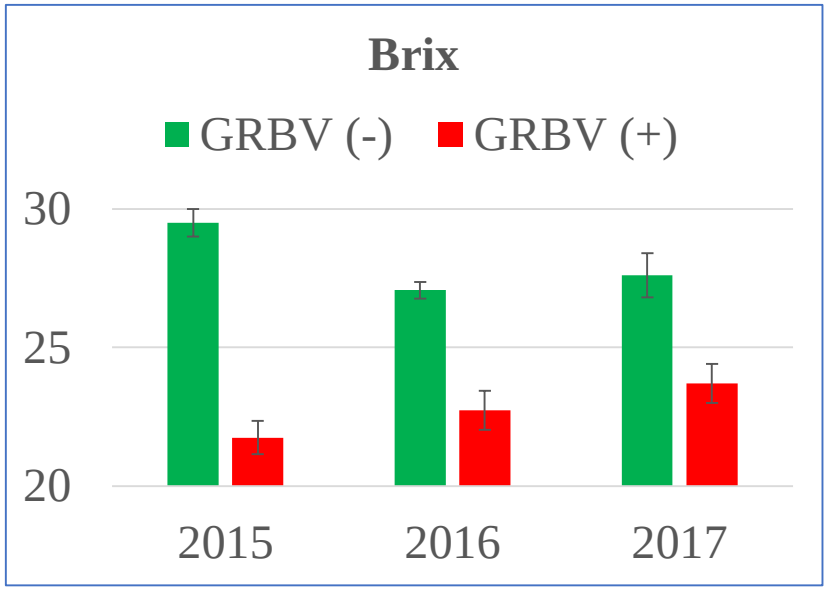
Others?

University of California
Agriculture and Natural Resources

Measured mean berry and juice components in healthy, GRBV(-), and infected, GRBV(+), dry-farmed Zinfandel vines, 2015, 2016 and 2017. Wunderlich, Sudarshana and Zalom, unpublished.







L.R. Wunderlich, UC Cooperative Extension, Foothill Grape Day 2020

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

Article

Cite This: J. Agric. Food Chem. XXXX, XXX, XXX−XXX

pubs.acs.org/JAFC

Grapevine Red Blotch Virus May Reduce Carbon Translocation Leading to Impaired Grape Berry Ripening

Johann Martínez-Lüscher,[†] Cassandra M. Plank,[†] Luca Brillante,[¶] Monica L. Cooper,[‡] Rhonda J. Smith,[⊥] Maher Al-Rwahnih,[§] Runze Yu,[†] Anita Oberholster,[†] Raul Girardello,[†] and S. Kaan Kurtural*[,†]

[†]Department of Viticulture and Enology and Oakville Experiment Station, University of California Davis, 1 Shields Avenue, Davis, California 95616, United States

[‡]University of California Cooperative Extension, 1710 Soscol Avenue, Napa, California 94559, United States

[⊥]University of California Cooperative Extension, 133 Aviation Boulevard, Santa Rosa, California 95403, United States

[§]University of California Davis Foundation Plant Services, 455 Hopkins Road, Davis, California 95616, United States

[¶]California State University - Fresno, Department of Viticulture and Enology, 2360 Barstow Avenue, Fresno, California 93740, United States

Supporting Information

ABSTRACT: Grapevine red blotch virus (GRBV) is suspected to alter berry ripening and chemistry. This study performed a physiological characterization of GRBV infected grapevines with attention to the factors leading to chemical changes during ripening of Cabernet Sauvignon in two rootstocks, 110R and 420A. RB(+) grapevines had transiently lower net photosynthesis; however, berry total soluble solids (TSS) accumulation was consistently reduced in the two years of study. Accumulation of anthocyanins and loss of titratable acidity and proanthocyanins were also delayed in RB(+) plants. However, the comparison of samples with the same TSS led to lower pH and anthocyanins content. The reduction in carbon import into berries under mild and transient reductions in carbon fixation suggested an impairment of translocation mechanisms with RB(+), leading into a desynchronization of ripening-related processes.

KEYWORDS: *anthocyanins, carbohydrate translocation, gemini virus, GRBV, proanthocyanidins, ripening decoupling, water status*

2017-2018 Virus testing of Young Vineyards planted with Certified Stock

(Kari Arnold, Kamyar Aram, Lynn Wunderlich and Neil McRoberts)

- "Certified" means **tested** for known virus pathogens before distribution to nurseries
  - Does not guarantee virus free, but still extremely important step to a clean vineyard
- 2 young vineyard blocks, less than 3 years old from plant date with certified material.
  - Block 1 planted 2014. Block 2 planted 2016.
- Used sampling protocol established for leafroll ("W" pattern). Tested for
  - GFkV (Fleck)
  - GFLV (Fanleaf)
  - GLRaV1 (LR1) GLRaV2 (LR2) GLRaV3 (LR3) GLRaV4 (LR4)
  - GPGV (Pinot gris virus)
  - GRBV (Red Blotch)
  - GRSPaV (Rupestris stem pitting)
  - GVA GVB
- 2017 Results:
  - Block1: 1/25 tested positive for red blotch
  - Block 2: 0/25 tested positive. Adjacent positive vines pulled.
  - Only other virus detected was Rupestris stem pitting
- 2018 retested same vines. Results:
  - Block 1: 1/25 tested positive for red blotch (same vine). Other adjacent vines (not in sampling W grid) with symptoms also positive.
  - Block 2: 1/25 tested positive for red blotch. Others with symptoms negative.
  - No other virus except for Rupestris stem pitting was detected.

Early virus symptoms hard to detect-virus unevenly distributed in vines.

Sampling protocol “W” for leafroll may not be effective strategy to capture red blotch infection in a vineyard block.

Identifying the vectors and understanding their biology remains a critical step for the entire process of “Start Clean, Stay Clean”

Soils and Plant Tissue Testing - C

Not secure | cecentralsierra.ucanr.edu/Agriculture/Soil_and_Plant_Tissue_Testing/

Apps Gmail UCCE Central Sierra

Soils and Plant Tissue Testing

The University of California does not provide soil or plant tissue testing services for growers. There are a number of laboratories that do provide this service.

List of soil and plant tissue testing labs.

List of labs that test for Red blotch.

TEST, Don't Guess!

UC does not endorse any one laboratory and we recognize this list may not be complete.

Foothill Soils: link to our soils page found under the Viticulture menu. Provides information and links to access the soil survey online via UC Soils Specialist Toby O'Geen's Soil Web. Useful for growers of all crops.

Diagnosing Soil Physical Problems: link to FREE UC publication. Scan of historic UCANR leaflet

Type here to search

4:55 PM
3/31/2020

Thank you!

lrwunderlich@ucanr.edu

530-306-0650

Available for Zoom Farm Calls too!