

LODI WINEGRAPE COMMISSION

LEAFROLL VIRUS TAILGATE TALK

October 17th, 2018

A special thanks to our host, LangeTwins Winery & Vineyards, and both the American Vineyard Foundation and the CDFA PD/GWSS Board for funding Grapevine Virus educational outreach in Lodi! Today's meeting is the culmination of months of dedicated research by the Lodi Winegrape Commission's Research, Education, & Communication Committee's Grapevine Virus & Mealybug Biocontrol Research Focus Groups.



AGENDA

Welcome by Stephanie Bolton, Lodi Winegrape Commission

Intro. to the Lodi Grapevine Virus & Mealybug Biocontrol Research Focus Groups

Summary of South Africa & New Zealand Leafroll Virus Management Strategies

Leafroll Virus Management Strategies by LangeTwins team & Charlie Starr

Presumed Red Blotch Vector by Cindy Preto, USDA-Parlier

Virus Workshop Stations in the Vines:

**VIRUS SCOUTING, VIRUS TESTING, MEALYBUGS & BENEFICIALS,
and ALFALFA HOPPERS** with experts

Virus Workshop Stations: This is an interactive tailgate talk, where you are welcomed into the Cabernet Sauvignon vineyard (Clone 7, planted in 2013, Freedom rootstock, 10x7 spacing) to learn how to identify possible virus symptoms, to identify vine mealybugs & evidence of beneficial insects, to take a proper virus testing sample, and to scout for threecornered alfalfa hoppers with a sweep net. Enter any marked row and find someone there to lead an interactive lesson. Check out the microscope table for an up-close look at virus vectors!

We hope that you will take what you learn today into your own vineyards and those that you manage! Sweep nets are available to check out from Julie Sasak, our new VITICULTURE OUTREACH ASSISTANT, at the sign-in table.

When you see a mealybug, think “leafroll virus”!

Leafroll virus is known as the most economically devastating virus because it is the hardest to manage.

LEAFROLL VIRUS & VINE MEALYBUG FACTS

(aka why we keep talking about them)

- vine mealybugs can infect a grapevine with LEAFROLL VIRUS in just one hour
- it only takes one vine mealybug to cause a leafroll virus infection
- each female vine mealybug can produce HUNDREDS of eggs (300 on average)
- vine mealybugs have SEVERAL generations each growing season (5-7 in Lodi)
- vine mealybug mating in the late summer – fall determines the population for the next growing season
- vine mealybugs move into the lower trunk and roots during the Winter, then move up the vine in the Spring when the weather warms up
- grapevines infected with leafroll virus *may* experience lower yields, inefficient photosynthesis, higher acidity levels, decreased quality, poor color, and delayed/inhibited ripening



| VIRUS NAME: | FANLEAF (GFLV) | LEAFROLL (GLRaV) | RED BLOTCH (GRBV) |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What happens to the vineyard? | <ul style="list-style-type: none"> - Decreased yield - Deformed & yellow leaves - Irregular, double-tipped shoots - Shot berries - Vine decline - Poor fruit color & quality | <ul style="list-style-type: none"> - Red leaves in fall (red varieties only) - Decreased yield - Lower Brix - Decreased lifespan - Vine decline - Poor fruit color & quality - Delayed budbreak | <ul style="list-style-type: none"> - Red leaves in fall (red varieties only) - Lower Brix, up to 6° - Decreased lifespan - Poor fruit quality |
| How can this disease spread? | <ul style="list-style-type: none"> - Top-working/Bud grafting - Planting material - Dagger nematodes | <ul style="list-style-type: none"> - Top-working/Bud grafting - Planting material - Mealybugs and scales (which can move by wind, birds, equipment, vehicles, and people) | <ul style="list-style-type: none"> - Top-working/Bud grafting - Planting material - Alfalfa leafhoppers and other possible unknown vectors |
| Watch out for: | <ul style="list-style-type: none"> - Sauvignon blanc may mask a fanleaf disease - Infected rootstock | <ul style="list-style-type: none"> - The incredible efficiency & widespread populations of the vine mealybug vector! - Infected vineyards upwind of your block - Virus-infected mealybugs likely survive on roots, so if you rip out a leafroll-infected vineyard you must treat the area for mealybugs & remove as much root material as possible before replanting! - Ants!!! Ants protect mealybugs from natural predators and help them move in the vineyard | <p>Wild or backyard grapevines which can be a sneaky source of virus for the vectors to carry into your vineyard! They think that this is how red blotch got into an FPS vineyard.</p> |
| Types: | Fanleaf virus | GLRaV-1, GLRaV-2, GLRaV-2 strain RG, GLRaV-3 , GLRaV-4, GLRaV 4-car, GLRaV-4 strain 5, GLRaV-4 strain 6, GLRaV-4 strain 9, GLRaV-4 strain De, GLRaV-4 strain Pr, GLRaV-7 (Leafroll 3 is the most economically important one) | Red blotch virus |

OUR CALIFORNIA GRAPEVINE VIRUS STRATEGY.

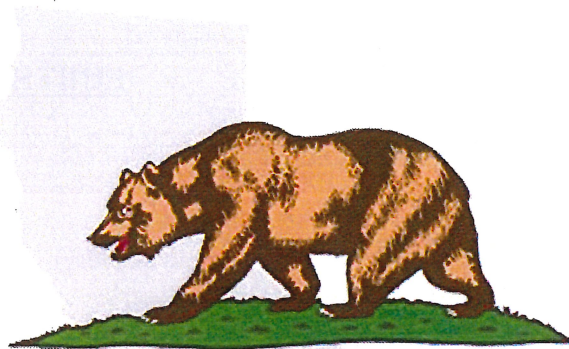


Decrease vector populations.



Lower virus inoculum.

Why? The future of our industry depends on what we do today.



CALIFORNIA REPUBLIC



We can't beat these viruses alone.



Growers

Education, vector management, and lowering the amount of virus inoculum on each farm.



Nurseries

Providing growers with reliably clean rootstock and scion material.



FPS

Providing nurseries with reliably clean propagation material.



CDFA

Administering an effective Grapevine Certification & Registration Program.



Academia

Scientific research to validate & improve management strategies and new technologies for virus detection & management.



Virus Testing Labs

Providing reliably accurate, efficient, and economical virus testing for plant material.



Wineries

Education and teamwork with growers to beat the virus challenge.



Extension

Virus education outreach and connection to resources needed.



IPM Companies

Vector control that keeps the natural enemies of vine mealybug doing their job.



PCAs/Viticulturists

Education, vector management, virus detection and management.



County Ag Commissioners

Education, vector management, regional organization and leadership.



Regional Associations

Education, vector management, regional organization and leadership.

LODI WINEGRAPE COMMISSION, est. 1991

LEAFROLL VIRUS TAILGATE TALK • October 17th, 2018 • lodigrowers.com

Please note: Thanks to everyone who contributed to today's meeting! The information presented today is intended as educational only. Each person will ultimately manage for mealybugs & viruses on an individual basis according to what makes economic sense for them personally.

FURTHER RESOURCES

VIRUS TESTING LABORATORIES

Agri-Analysis LLC

950 W Chiles Rd, Davis CA 95618 (sample delivery)
PO Box 285, Davis CA 95616 (mailing address)
Dr. Alan Wei | info@agri-analysis.com
800.506.9852 | agri-analysis.com

AL & L Crop Solutions

7769 N Meridian Rd, Vacaville CA 95688
Dr. Anna-Liisa Fabritius | info@allcropsolutions.com
530.387.3270 | allcropsolutions.com

California Seed and Plant

3556 Sankey Rd, Pleasant Grove, CA 95668
Dr. Parm Randhawa | parm.randhawa@csplabs.com
Sukhi Pannu | sukhi.pannu@csplabs.com
916.655.1581 | csplabs.com

eurofins US | EBDI Laboratories

7240 Holsclaw Rd, Gilroy CA 95020
Dr. Raquel Salati | raquelsalati@eurofinsUS.com
408.846.9964 | eurofins.com/biodiagnostics

Foundation Plant Services – Virus Diagnostics

455 Hopkins Road, Davis CA 95616
530.752.3590 | fps.ucdavis.edu/custommain.cfm

Sunburst Plant Disease Clinic Inc.

677 E Olive Ave, Turlock CA 95380
Dr. Bhanu Donda | bdonda@sunburstpdcinc.com
Dr. Sam Livingston | slivingston@sunburstpdcinc.com
209.667.4442 | sunburstpdcinc.com

Wonderful Nurseries – Virus Testing Laboratory

449 N Zerker Rd, Shafter, CA 93263
Brad Kroeker | 661.406.9919
brad.kroeker@wonderful.com | wonderful.com

CDFA Grapevine Registration & Certification Program

1220 N Street, Room 344, Sacramento CA 95814
916.654.0435 | nurseryservices@cdfa.ca.gov
cdfa.ca.gov/plant/pe/nsc/nursery/grapevine.html

VINE MEALYBUG MATING DISRUPTION

Pacific Biocontrol (product in development)

911 Industrial way, Suite A, Lodi CA 95240
Jeannine Lowrimore
jlowrimore@pacificbiocontrol.com
209.603.9244 | pacificbiocontrol.com

Suterra (also our VMB trap donators! thank you!)

2401 E Orangeburg Ave, #675, Modesto CA 95355
20950 NE Talus Pl, Bend OR 97701
Loraine Lee | loraine.lee@suterra.com
Sara Goldman | sara.goldman@suterra.com
209.595.5254 | suterra.com

BENEFICIAL INSECTS

Associates Insectary

PO Box 969, Santa Paula CA 93061
Brett Chandler | info@associatesinsectary.com
805.933.1301 | associatesinsectary.com

FAR, Inc.

550 Foothills Pkwy, Corona CA 92882
Joe Barcinas | farinc@att.net
951.371.0120 | far-inc.com

USDA Tree Assistance Program (TAP)

USDA San Joaquin Co. Farm Service Agency
(Red Blotch Virus)
7585 S Longe St, Ste. 10, Stockton CA 95206
Jeff Torres | jeff.torres@ca.usda.gov
209.337.2124 x2 | fsa.usda.gov

University of California

Dr. Maher Al Rwahnih

Grapevine Virus Testing Expert
Foundation Plant Services Diagnostics & Research Lab
530.574.5463 | malrwahnih@ucdavis.edu

Dr. Kent Daane

Vine Mealybug Expert
Kearney Agricultural Research & Education Center
559.646.6522 | kdaane@ucanr.edu

Dr. Lucia Varela

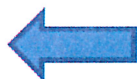
Mealybug & Ant Expert
North Coast IPM Advisor, UCCE
707.565.2621 | lgvarela@ucanr.edu

EDUCATIONAL RESOURCES

Book: *Leafroll 3 Virus and how to manage it*. Edited by Ruby Andrew, Vaughn Bell, Nick Hoskins, Gerhard Pietersen, and Caine Thompson. New Zealand. 2015. (copy available to borrow from the Lodi Winegrape Commission)

Book: *Grapevine Viruses: Molecular Biology, Diagnostics, and Management*. Edited by Baozhong Meng, Giovanni P. Martelli, Deborah A. Golino, and Marc Fuchs. 2017. (copy available to borrow from the Lodi Winegrape Commission)

Institute for Grape and Wine Sciences
South Africa | Leafroll Virus Management
Prof. Gerhard Pietersen
igws.co.za/content/fact-sheets/leafroll



Leafroll 3 Virus App from New Zealand
Find it on your app store

Lodi Winegrape Commission

2545 W Turner Rd, Lodi CA 95242
Dr. Stephanie Bolton | stephanie@lodiwine.com
209.367.4727 | lodigrowers.com

UC Cooperative Extension - San Joaquin County

2101 E Earhart Ave, Suite 200, Stockton CA 95206
Paul Verdegaal (retired) | psverdegaal@ucanr.edu
209.953.6119 | cesanjoaquin.ucanr.edu

Dr. Cindy Preto

Threecornered Alfalfa Hopper Expert
USDA – Parlier
crpreto@ucdavis.edu

You can always learn more about viruses and their vectors (like mealybugs!) at our **CD11 LODI PCA NETWORK BREAKFAST MEETINGS**, held on the first Tuesday morning of every month except February from 7:30-9am at Burgundy Hall, Lodi Grape Festival Grounds, 413 E Lockeford St. Everyone is welcome at these meetings!
RSVP to lwwc@lodiwine.com or 209.367.4727.

A big thanks to LangeTwins Winery and Vineyards for hosting today's LEAFROLL VIRUS TAILGATE TALK and sharing their management strategies with us! We also really appreciate the effort of Charlie Starr, PCA, in virus testing, mapping, and regional leadership!

Thank you to the LWC Research, Education, & Communications Committee and their Mealybug Biocontrol & Grapevine Virus Research Focus Group volunteers for helping with today's meeting!

Partial funding was provided by the American Vineyard Foundation and the CDFA's PD/GWSS Board as part of a Grapevine Virus Outreach Grant – THANK YOU SO MUCH!

VINE MEALYBUGS

BY THE NUMBERS



BY: THE LODI WINEGRAPE COMMISSION

In the LODI AVA, our vine mealybugs have 5-7 generations per growing season.
On average, the females lay 300 eggs each, with about half of those eggs being female.

1ST GENERATION

1 female +
1 male mealybug

2ND GENERATION

1 female x 300 eggs
= 300 mealybugs
150 females

3RD GENERATION

150 females x 300 eggs
= 45,000 mealybugs
22,500 females

4TH GENERATION

22,500 females x 300 eggs
= 6,750,000 mealybugs
3,375,000 females

5TH GENERATION

3,375,000 females x 300 eggs
= 1,012,500,000 mealybugs
506,250,000 females

6TH GENERATION

506,250,000 females x 300 eggs
= 151,875,000,000 mealybugs
75,937,500,000 females

7TH GENERATION

by the 7th generation, those 2 original mealybugs are now

75,937,500,000 females x 300 eggs =

22,781,250,000,000 mealybugs

which then overwinter under the bark and in the roots – helped by ants – until the Spring



Did you know that grapevine leaves are not normally supposed to turn red in the fall for most varieties?

(Exceptions include: Petite Sirah, Malbec, Carignan, Carmenere, Ruby's Red, Alicante, Teroldego, and possibly others – these may naturally turn red or reddish)

Although beautiful in color, grapevine leaves naturally turn yellow, orange, and brown. When leaves turn red it is an indication of a problem – usually physical injury of the vine, a nutrient deficiency, or a grapevine virus disease. Since it is most expensive to test for and manage a virus disease, it is wisest to rule out all other causes of red leaves first.

NOTE: Vines with viruses may or may not express symptoms such as red leaves. Also, white varieties and rootstocks do not show the red leaf virus symptom.

A few red leaf examples from around the LODI AVA ...



This leaf is from a vine which tested positive for leafroll virus. Testing is crucial when it comes to viruses because visual identification alone is not accurate enough.



This leaf is from a Cabernet Sauvignon vine which was marked for rogueing due to virus just weeks prior to harvest. The best time to scout for red leaf virus symptoms is around harvest.



The red colors in the leaves in this Merlot vineyard only showed up after the mites were controlled.



This Cabernet Sauvignon vineyard has mealybugs and ants, putting it at risk for leafroll disease, so leaves were sampled for viruses around harvest time.



The spotty red color in these Cabernet leaves is likely due to mites, not a virus.

RED LEAF FLOW CHART (for red grape varieties only).

Adapted from the Rutgers University "Red Leaves in the Vineyard: Abiotic and Biotic Causes" Factsheet FS1260.

I HAVE RED LEAVES ON AT LEAST A FEW VINES.

(PS this is almost everyone in California right now. You are not alone).

