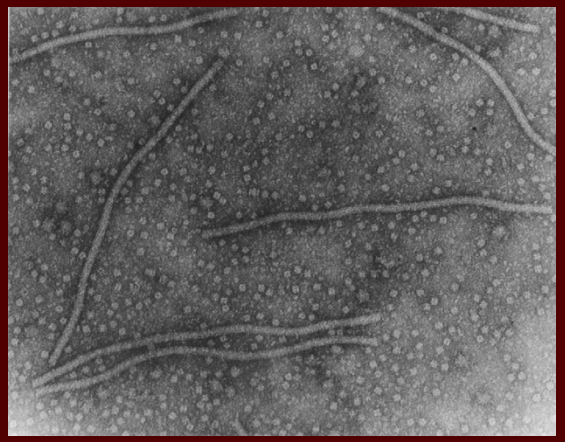
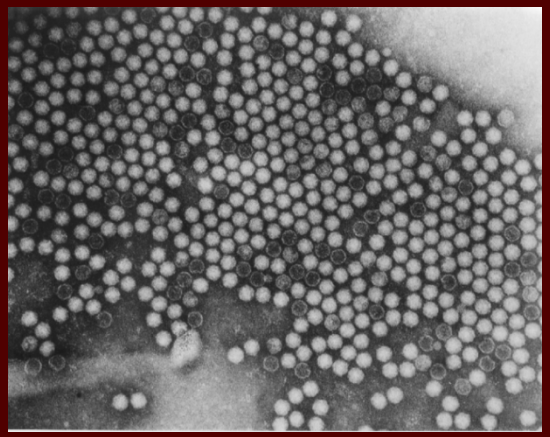
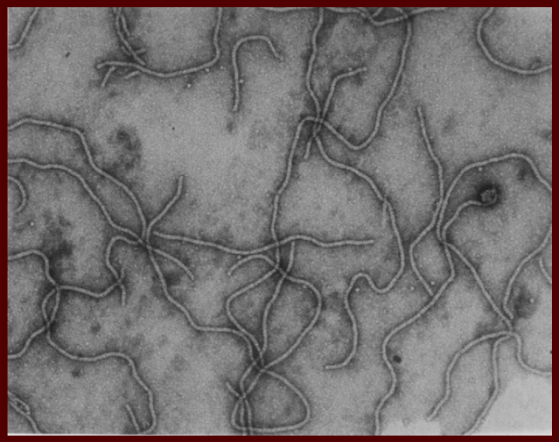
Virus Status of the Texas Grape Industry







TEXAS A&M AGRILIFE EXTENSION

2017 Advanced GRAPE GROWER Workshop

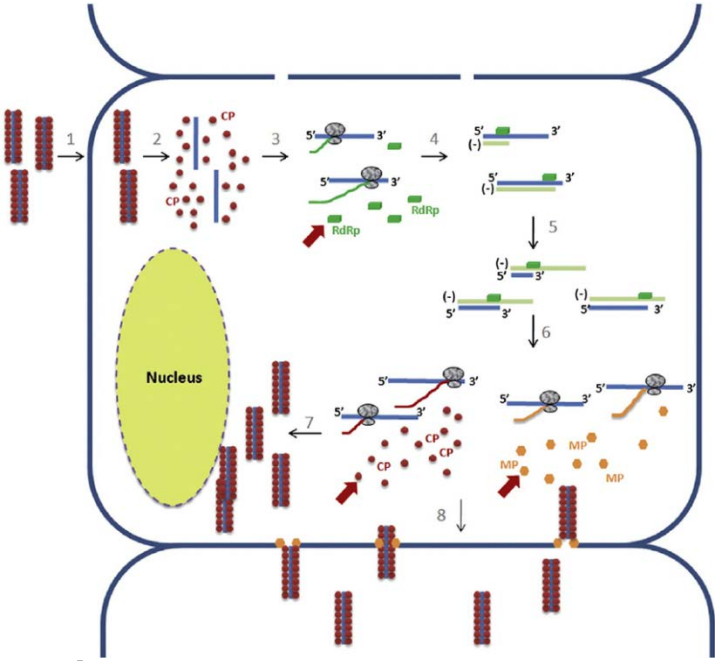
Hill Country University Center, Fredericksburg

June 19-20 2017

Sheila McBride Program Extension Specialist

Texas Plant Disease Diagnostic Lab

Virus Biology



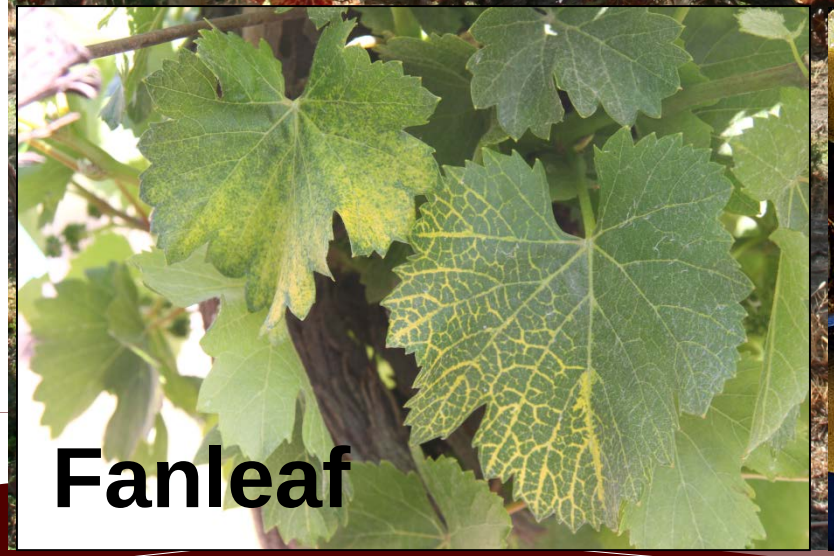
- Obligate parasites - must have living host to replicate, cannot be cultured/grown in the classic way such as on growth media,
- Reproduce only inside infected cells,
- Depend on the aid of vectors (insects, nematodes, humans), propagation or the environment for their dissemination (spread).

Viruses infecting Grapevine

- Grapes are hosts to >70 infectious agents globally
- 15 families, 26 genera, several unassigned species

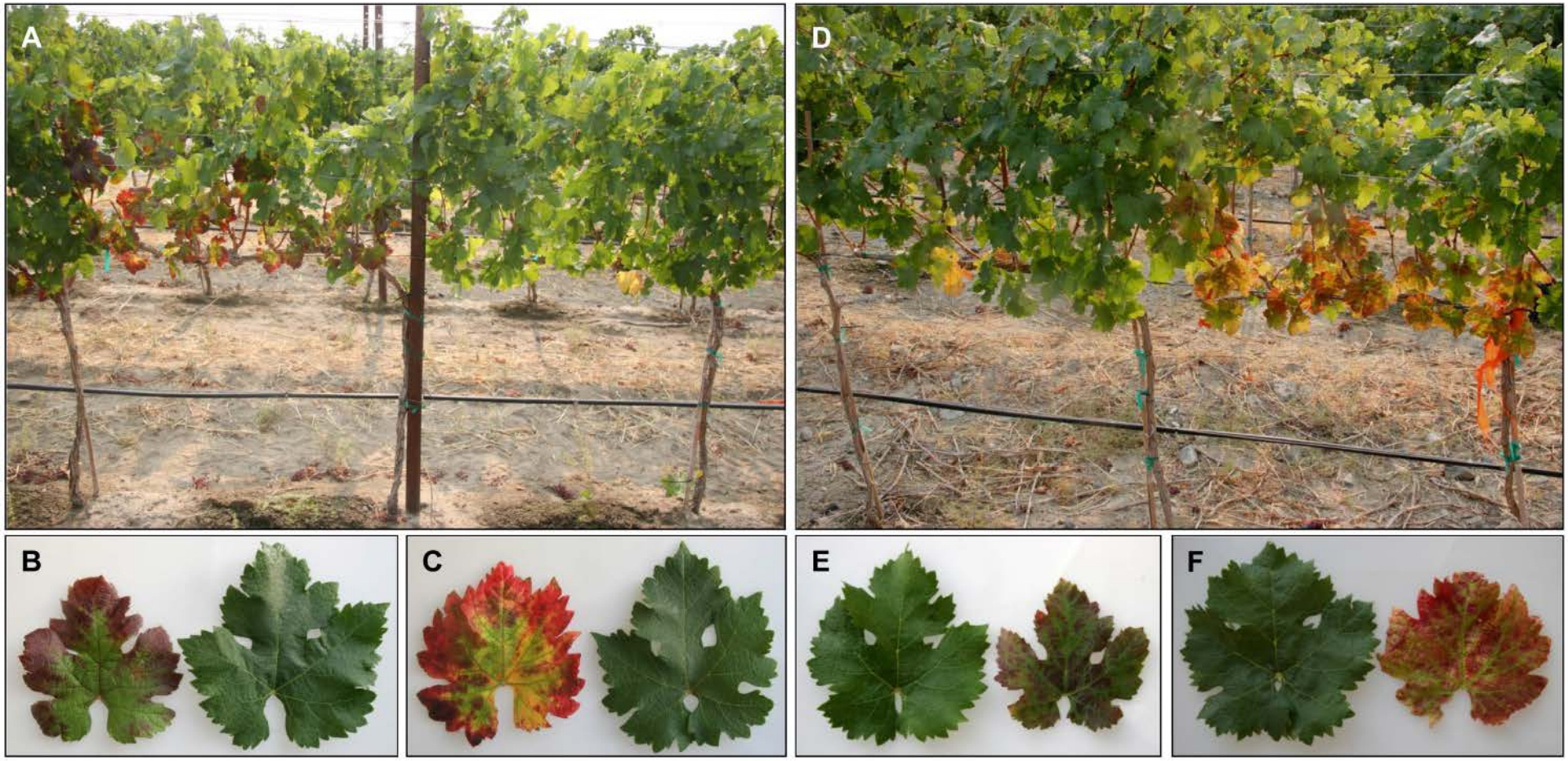
Major Virus Diseases

TEXAS A&M AGRILIFE EXTENSION



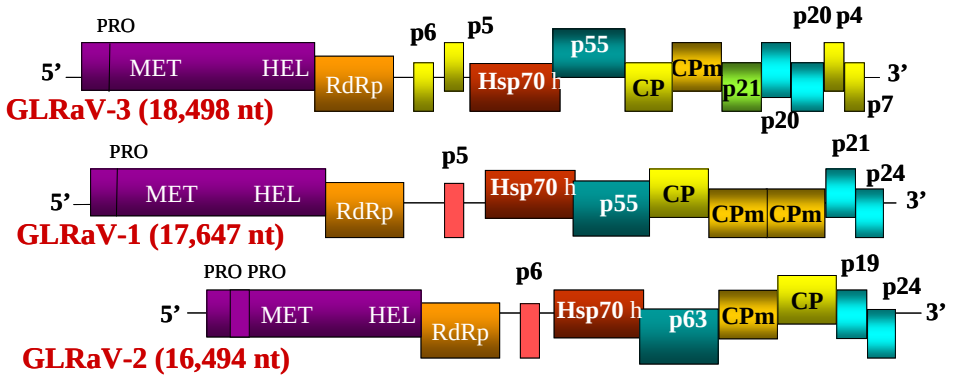
Major Virus Diseases

- Redblotch disease is becoming an emerging threat to the sustainability of the US grape industry



Grapevine Leafroll Disease (GLD)

- Most widespread
- Associated with several distinct closteroviruses
- Most GLRaVs belong to genus *Ampelovirus*
- *Grapevine leafroll-associated virus 3* (GLRaV-3) is predominant



GLD Symptoms: Discoloration

Cabernet Franc

Chardonnay

GLD Symptoms: Leaf Rolling

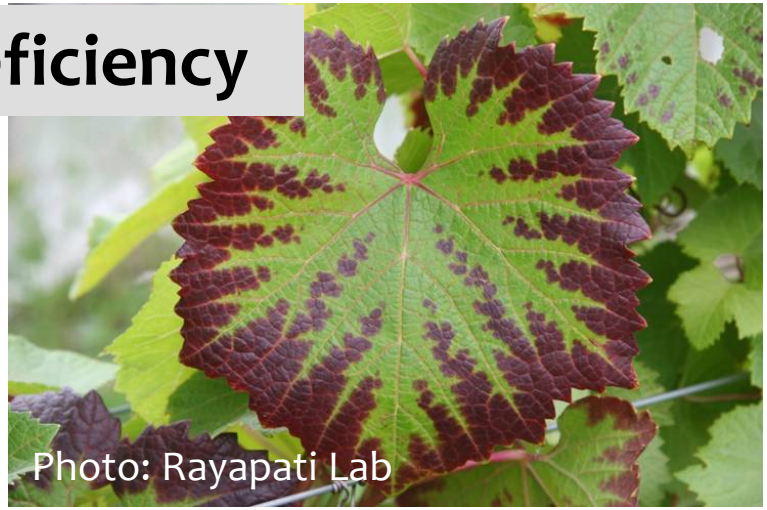
Merlot

Chardonnay

‘Leafroll-like’ Symptoms

TEXAS A&M AGRILIFE EXTENSION

P deficiency



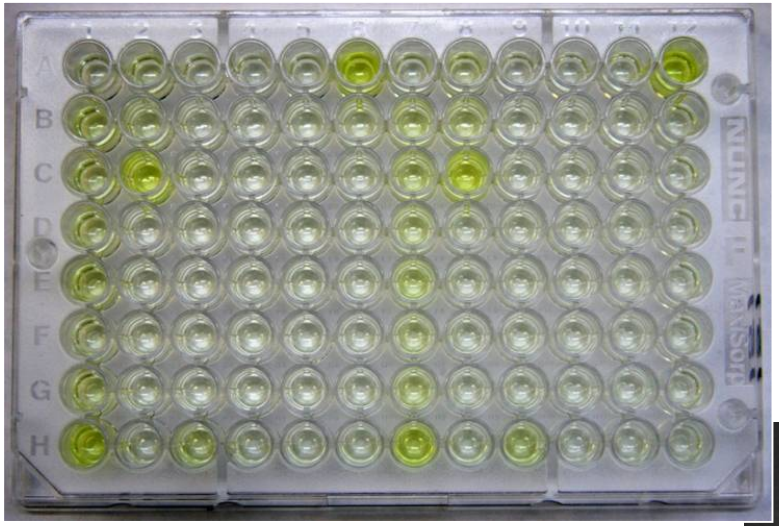
GLD

Mechanical Injury

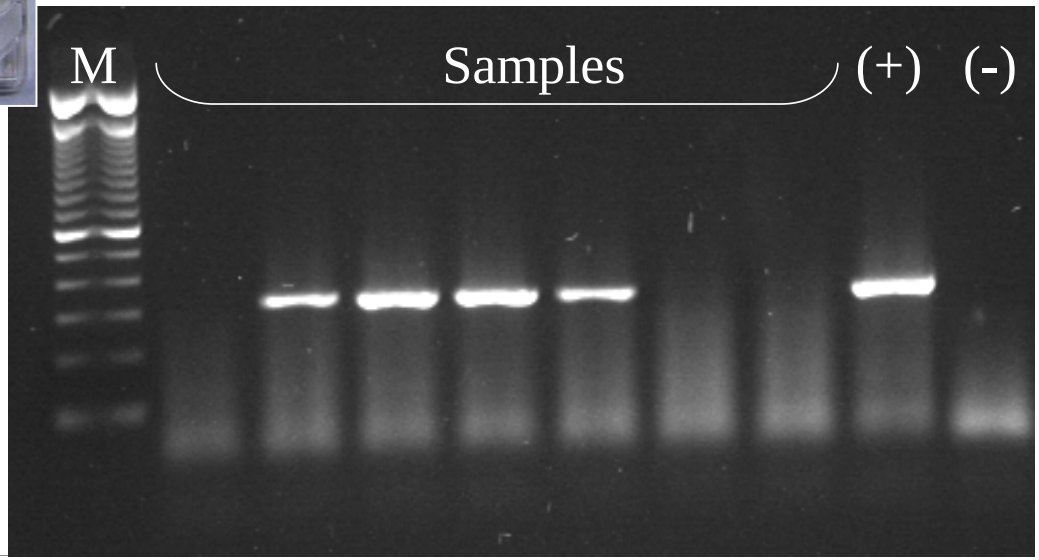
Transmission of GLRaVs

- And understanding of virus vector life cycle useful for disease management

Detection of GLRaVs



Serological assays (ELISA)



Molecular assays (RT-PCR)

GLD Spread Within Vineyard

GLD Spread Within Vineyard


Cabernet Sauvignon
Chardonnay

Negative Impacts of GLD

- Reduced fruit load
- Delayed and uneven ripening
- Reduced sugar
- Increased acidity
- Dependent on variety, clone, rootstock, site, season, leafroll type and strain

‘Healthy’

GLD+

Photo: M. Al Rwahnih

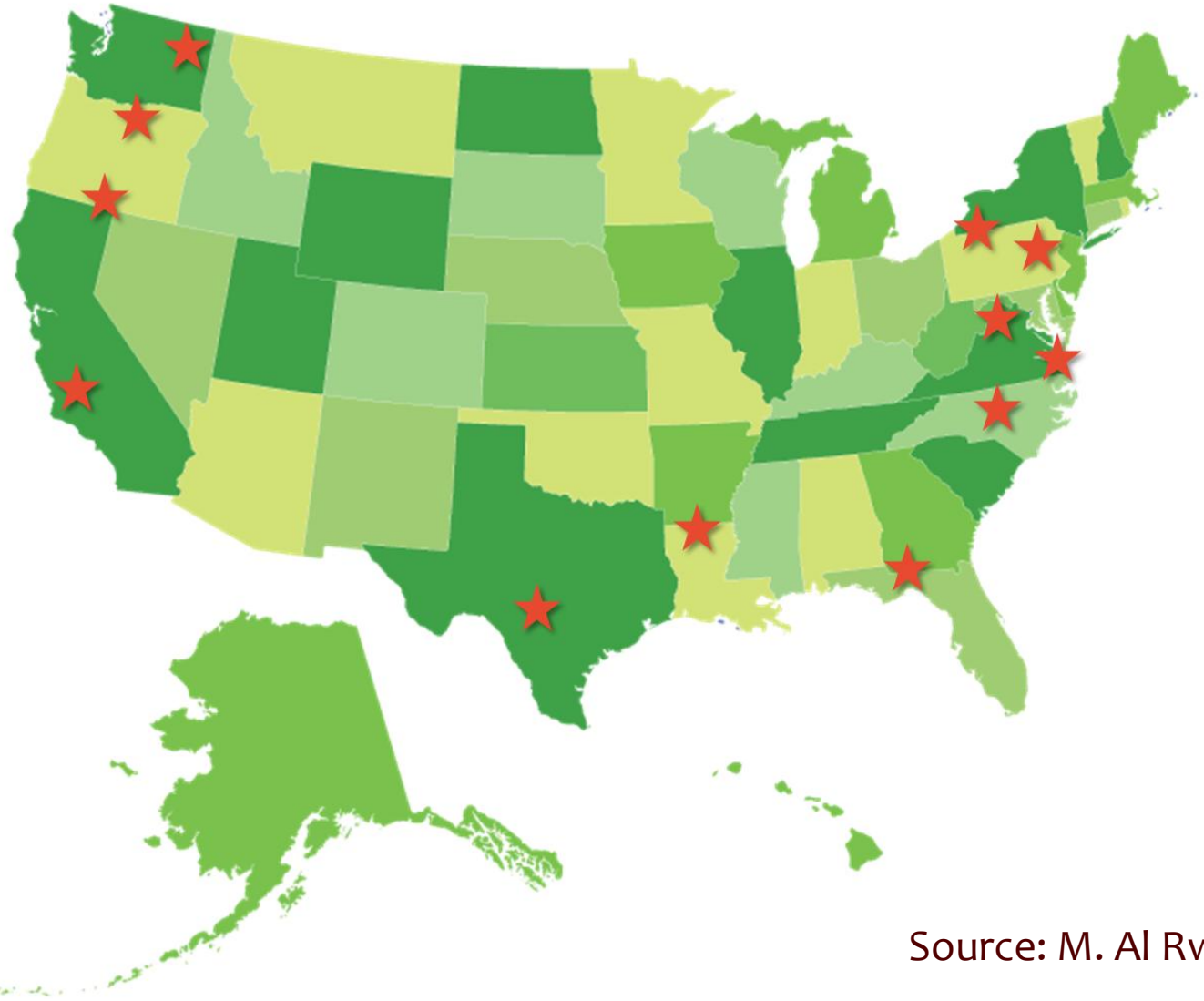
- Mixed infections of multiple viruses often results in enhanced negative impacts

Fanleaf (GVFL)

- Caused by several nepoviruses
- Possess RNA genomes
- Vegetatively transmitted
- Field spread mainly by vectors: longidorid (needle) nematodes
- Associated with fruit yield losses and vine decline

Grapevine Redblotch Disease

GRBaV is widespread in the US

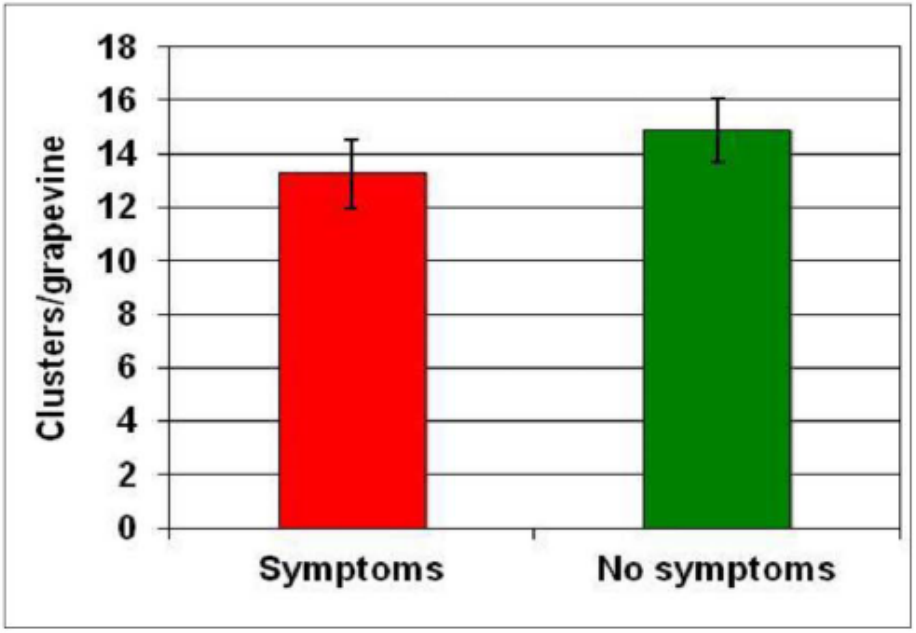


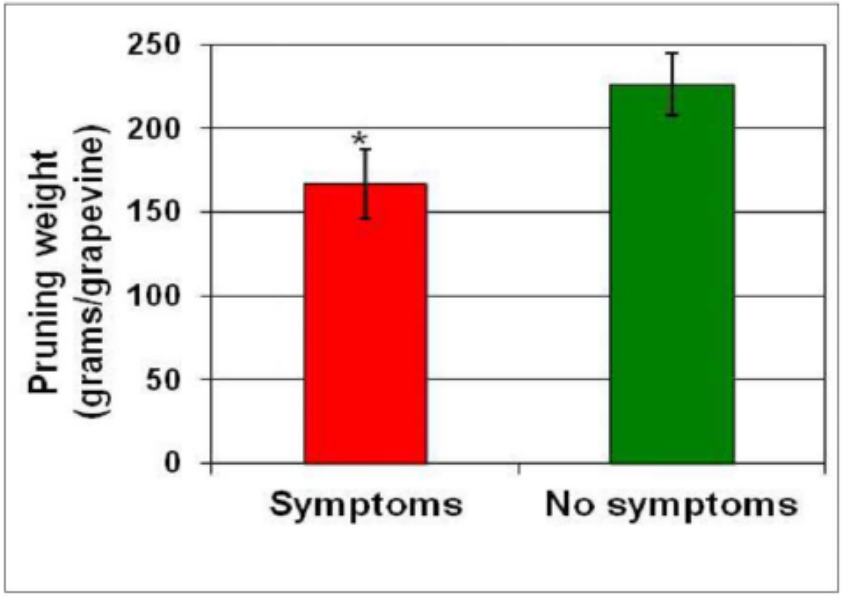
Source: M. Al Rwahnih

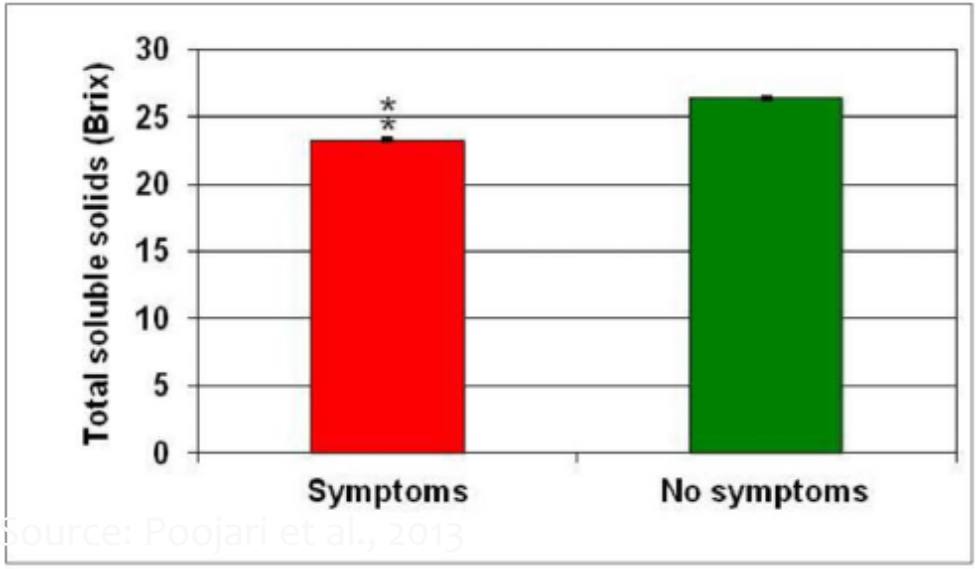
Grapevine redblotch-associated virus

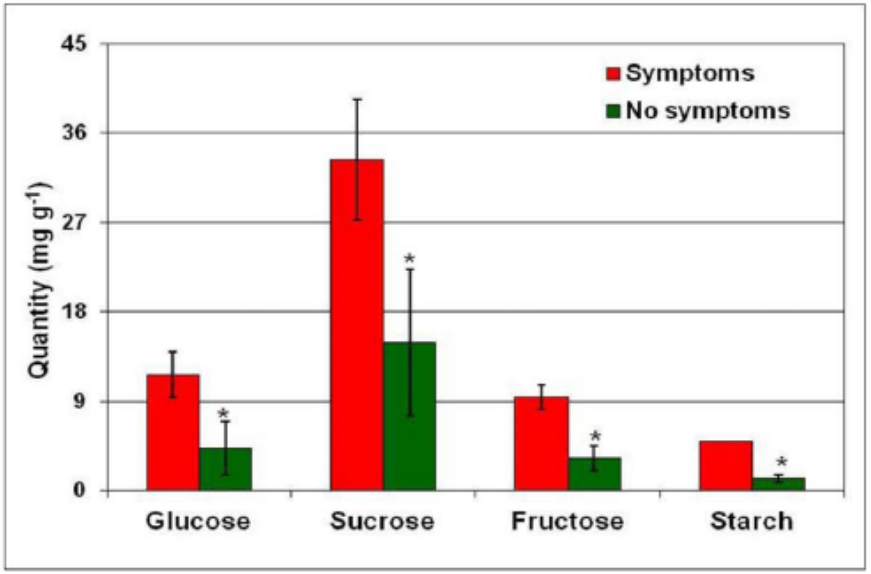
- Posses a circular ssDNA genome
- Three-cornered Alfalfa Hopper, *Spissistilus festinus*, identified recently as a vector
  - Other vectors currently being investigated

GLD-like Impacts of Redblotch









Source: Poojari et al., 2013

Virus Survey in Texas Vineyards

- Sample collection
  - Growers and Viticulture Specialists
- Sample preparation, ELISA and/or RT-PCR
- Gel electrophoresis

Blanc du Bois (GLRaV-3+)

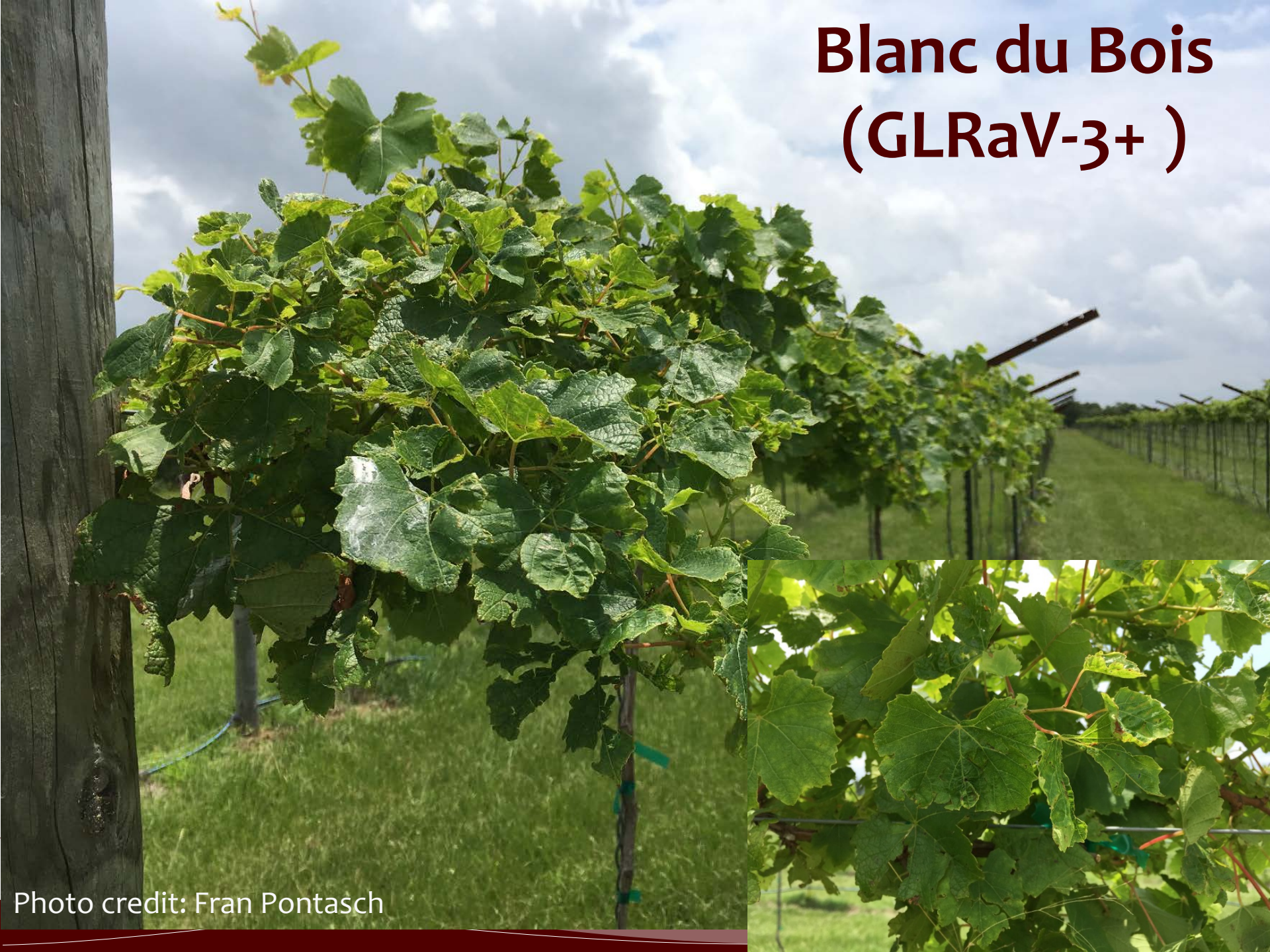


Photo credit: Fran Pontasch

Redblotch Symptoms

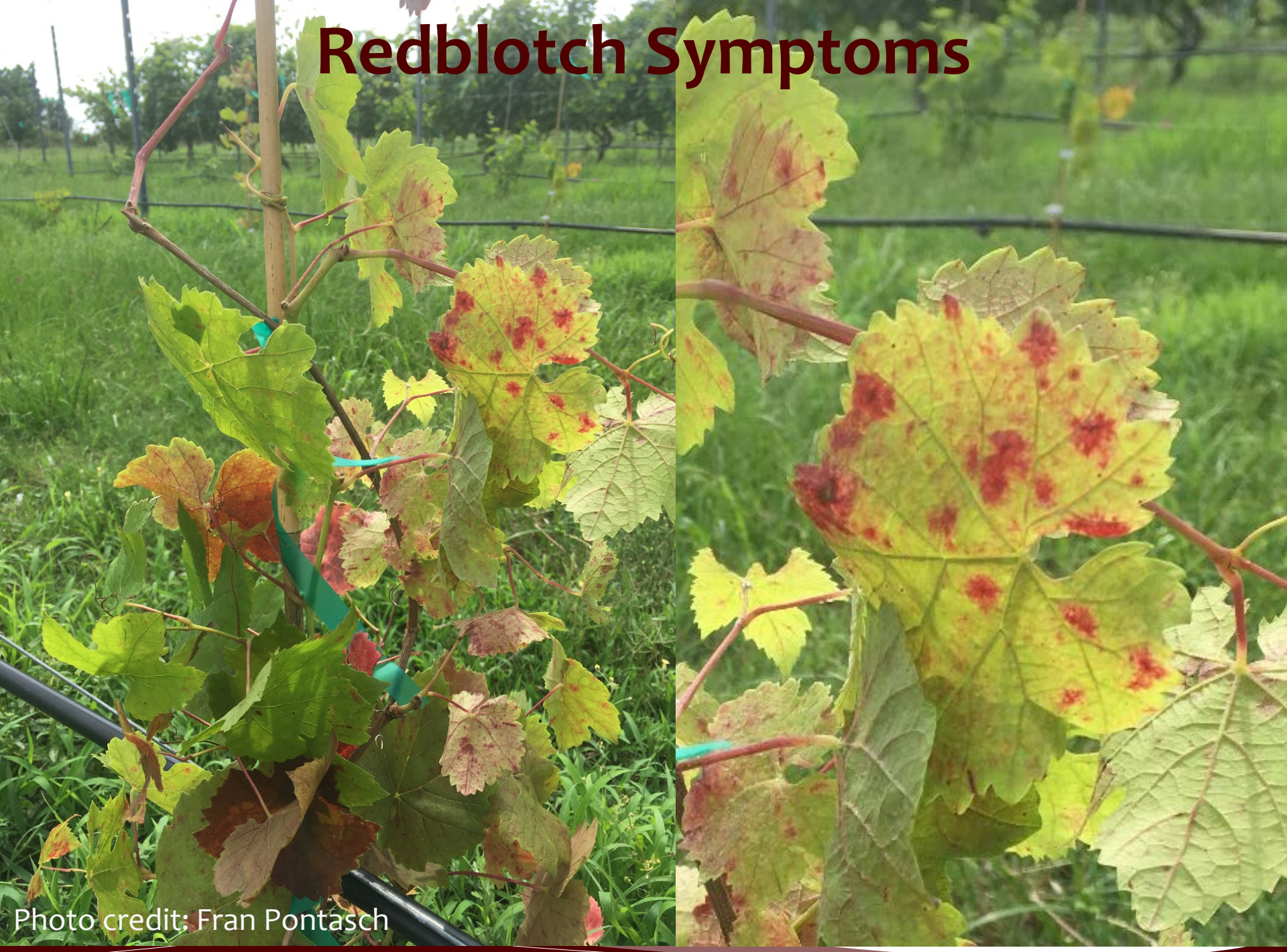
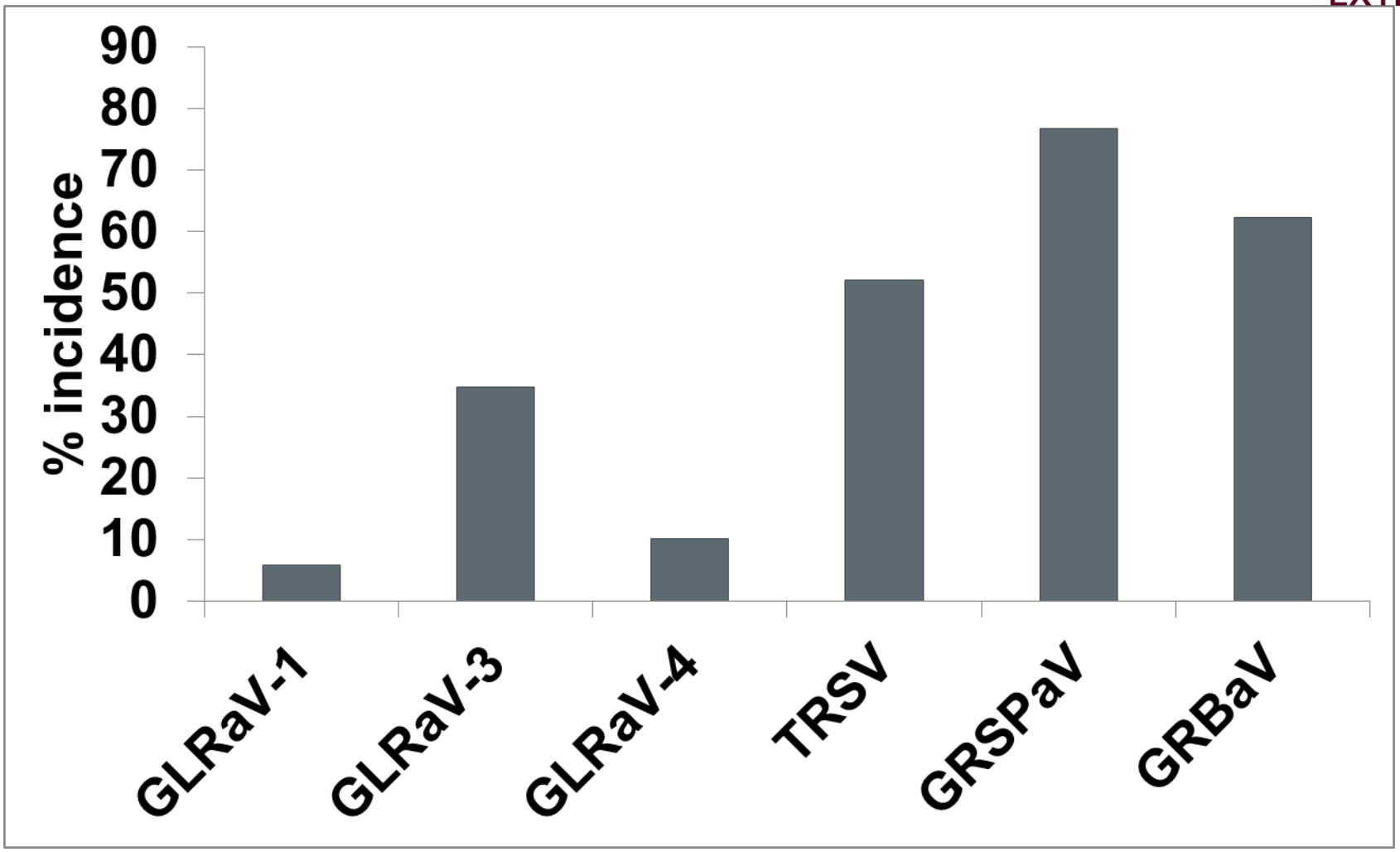


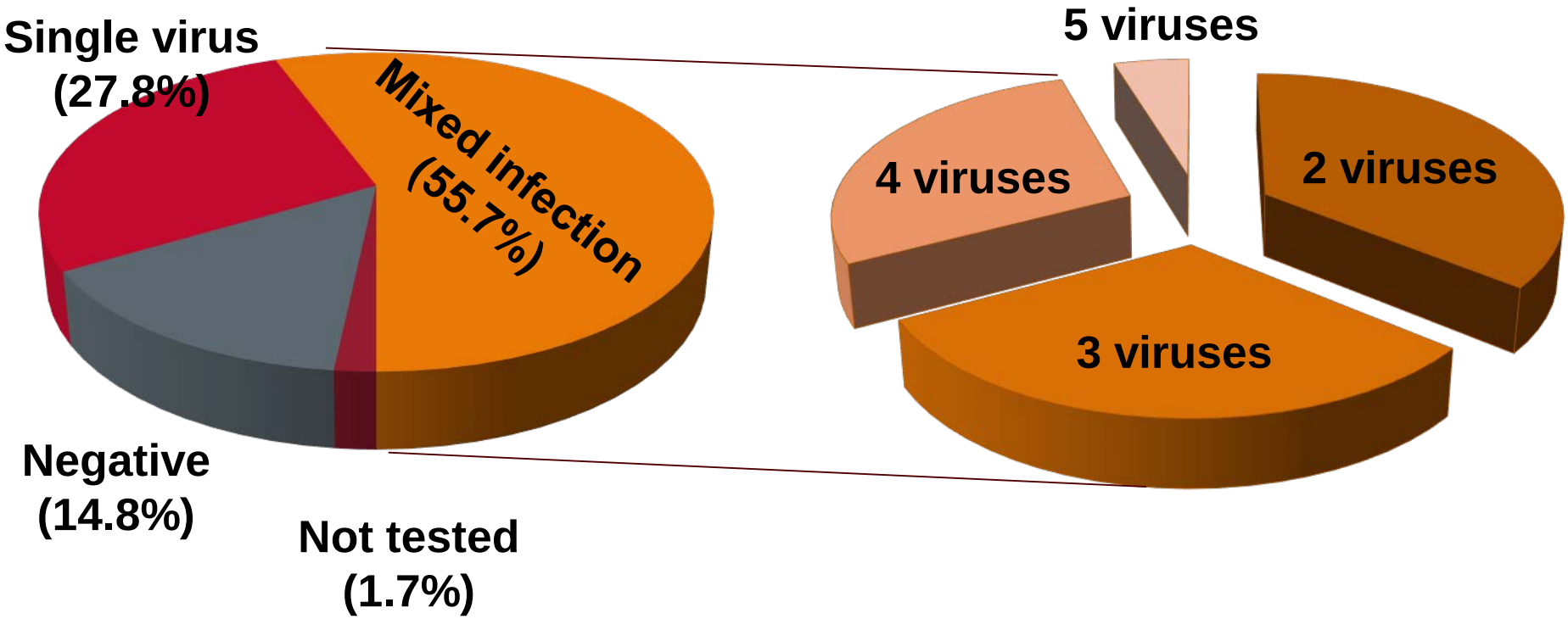
Photo credit: Fran Pontasch

Viruses detected 2016



- Based on analysis of 115 samples

Predominance of Mixed Infections



GLRaV-3

Austin
Hildalgo
Gillespie
Terry
McClennan
Hockley
Walker

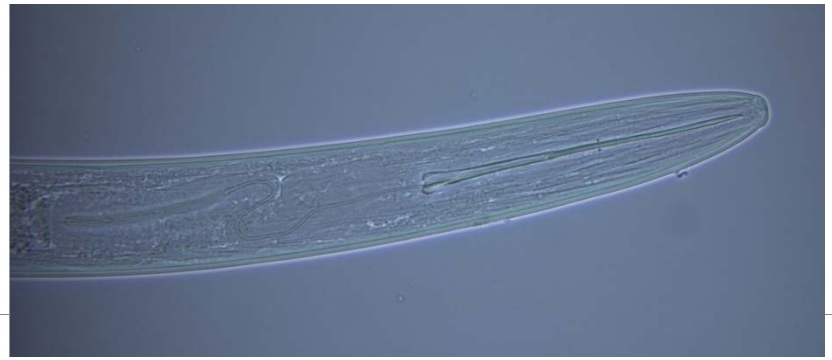
GRBaV

Austin, Hildalgo, Gillespie, Terry, Harris, Victoria, Lynn, Walker

Additional Findings - 2016

- **First Report of *Tobacco ringspot virus* Infecting an American Hybrid Grape Cultivar in Texas**

  June 2017, Volume 101, Number 6 Page 1062
  https://doi.org/10.1094/PDIS-01-17-0111-PDN
- Nepovirus- Transmitted by a nematode
  - *Xiphinema americanus (Dagger)*



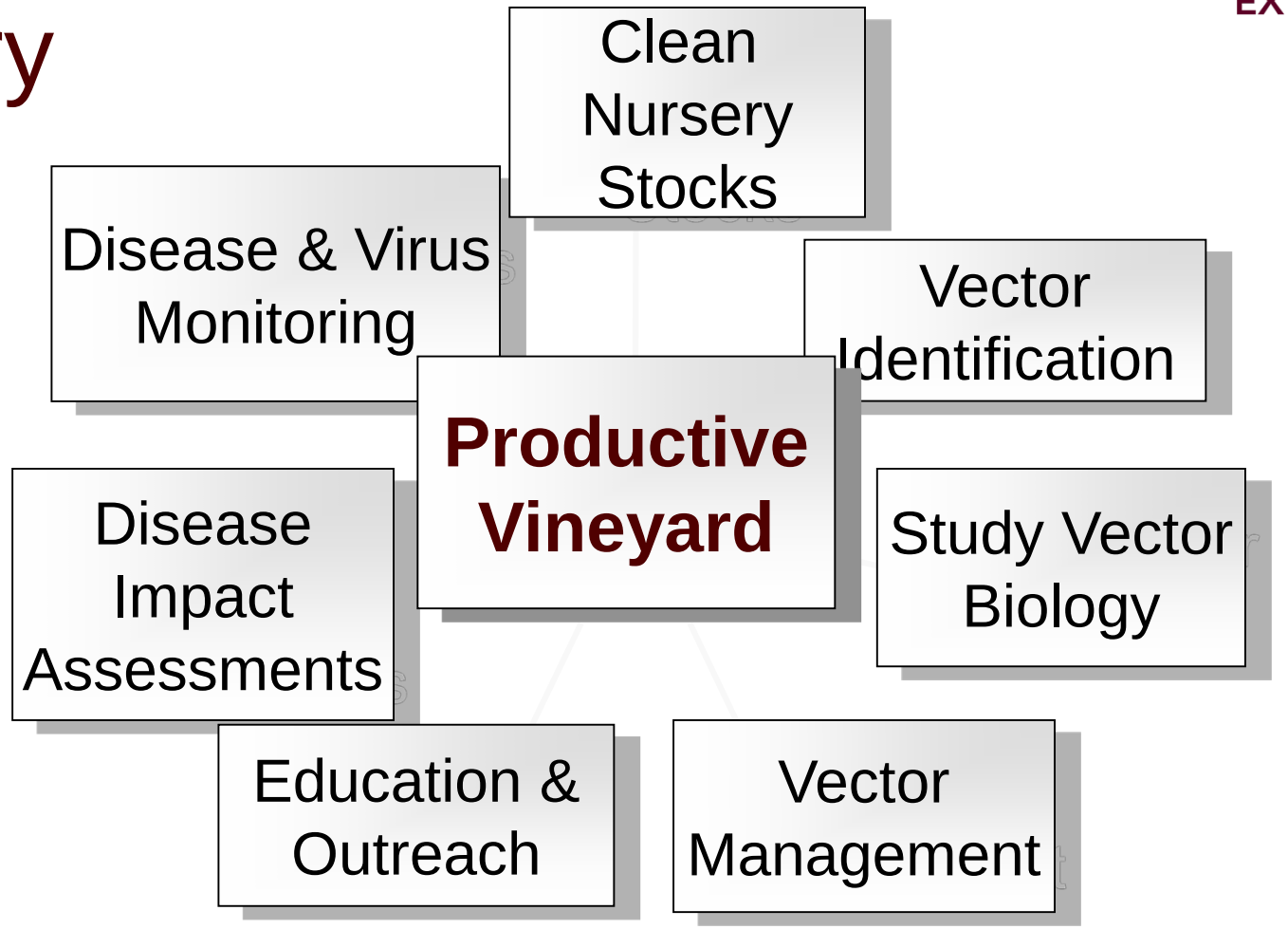
Update on 2017 Findings

- Soil samples collected from the TRSV positive vines
  - *Xiphinema sp.* detected,
  - PCR pending for detection of virus from nematodes collected.
- 50 Samples submitted
  - ELISA results for GVLRa-3 and GVFL
    - GVLRa-3→ 7 positives found in 3 Blanc du Bois, 1 Victoria Red, 1 Black Spanish, 1 Sangiovese, and 1 wild mustang.
    - GVFL→ All samples negative.
  - PCR results pending for Grapevine leafroll-associated virus 1, Grapevine leafroll-associated virus 2, 3, 4, Tobacco ringspot virus, Grapevine fanleaf virus, Grapevine virus A and B, Grapevine rupestris stem pitting-associated virus, Grapevine red blotch-associated virus.

Managing Grape Virus Diseases

- Propagate clean nursery stocks
  - Buy only from certified nurseries
- Practice area-wide vector management
  - Use IPM tactics: insecticides, parasitoids, mating disruption
- Manage virus alternative hosts
  - Free-living grapes in riparian habitats
- Overall goal is to '***Start Clean***' and '***Stay Clean***'

R&D Needs for a Growing Industry



- Virus disease management will be critical to maintaining a productive vineyard

TEXAS A&M AGRILIFE EXTENSION

June 2016

Guide for Recognizing and Collecting Samples to Test for Grapevine Viruses

By Olufemi Alabi and Sheila McBride

Texas A&M University Department of Plant Pathology and Microbiology

Viruses infecting grapevines have been recognized globally as major threats to the productivity of vineyards. Among them, grapevine leafroll-associated viruses (GLRaVs) and grapevine fanleaf virus (GFLV) are widespread and have been linked to decline in vine productivity and wine quality. Vine to vine transmission of GLRaVs and GFLV occur via insect and nematode vectors, respectively. A timely identification of infected vines enables implementation of measures to mitigate their spread within and between vineyard blocks. Symptoms caused by leafroll and fanleaf (Fig. 1) viruses may mimic symptoms of other disorders. Also, pre-symptomatic infections may occur. Therefore, clinical lab assays are needed to diagnose suspect vines. These viruses inhabit the phloem tissues of the grapevine and are unevenly distributed within the vine, making it further difficult to diagnose. These impediments can be overcome via collection of good tissue samples at time periods optimal for virus detection.

If your vines show any of the symptoms below, you should have them tested. The optimal time for virus disease symptoms expression in grapevines is post-*véraison* (onset of berry ripening). However, sampling can occur on vines any time of the year and there may even be value to sampling non-typical or asymptomatic vines. Dormant vines may be sampled by removing cane pieces in a manner similar to collecting leaves.

Sending samples to TPDDL

Proper sampling can ensure a proper diagnosis

- **Representation of transition area between symptoms being observed.**
- **Entire plant if possible, if not foliar symptoms and subsample of root tissue.**
  - **Fresh and kept fresh.**
- **Complete information (completed form)**
  - **Note dates/times (when did symptoms begin to appear?).**
  - **Description of chemical management practices in the past 4 weeks.**
- **Photographs helpful when putting the pieces of the puzzle together.**

Texas Plant Disease Diagnostic Lab

The TX Plant Clinic

The Texas Plant Disease Diagnostic Laboratory, located in College Station, Texas, is a service lab of the Department of Plant Pathology and Microbiology at Texas A&M University in conjunction with Texas A&M AgriLife Extension Service.

*****IMPORTANT NOTICE*******

We are undergoing many changes and updates!! Such as, updated Routine Diagnostic & Nematode forms!!!! Please be sure when submitting a sample to the clinic you are using the newest version of our forms. They will have the revision date of 6/17 in the top right corner. Also, changes are being made to our website, so continue to browse our website for the most up to date information!!

Customer sample inquiry (phone) support is available from 9:00am -12:00noon and 1:00pm – 4:00pm, Monday to Friday when the TX Plant Clinic is open.

For assistance with plant health issues, please contact your local Texas A&M AgriLife Extension county office. If contacting us, please email to get a quicker response. Our email contact is plantclinic@tamu.edu . Thank you for your patience.

Check out articles from our BLOG. The latest blog post is featured below. These are occasional articles of interest that are put together to share some happening in the Texas Plant Disease Diagnostic Lab. And LIKE US on our Facebook Page.

Rapid Decline of Oaks

WHAT WEDNESDAY VLOG

FORMS / INSTRUCTIONS

- D1178 – General Diagnostic Form and Instructions
- D827 – Nematode Detection Assay and Instructions
- Other Submission Forms and Instructions: Citrus Greening, Pierce's Disease, etc.

BLOG

- Rapid Decline of Oaks
- New treatment for the management of Cotton Root Rot

TEXAS A&M AGRILIFE EXTENSION

TPDDL use only.
Sample #:

Pmt type:
Amt:

Texas Plant Disease Diagnostic Laboratory
1500 Research Parkway, Suite A130
Texas A&M University Research Park
College Station, Texas 77845
Email: plantclinic@tamu.edu
Phone: 979.845.8032 Fax: 979.845.6499
http://plantclinic.tamu.edu

TEXAS A&M AGRILIFE EXTENSION

D-1178
6/17

Plant Disease Diagnosis Form

Submitter contact information (Please print.)

Name: _____

Company name (if commercial): _____

Address: _____

City: _____ State/Zip: _____

County: _____

Phone: _____

Email: _____

Submitter is: ☐ AgriLife personnel ☐ Homeowner ☐ Consultant
☐ Golf course ☐ Commercial ☐ Other_____

Grower contact/sample location information (Complete if different from submitter.)

Name: _____

Company name (if commercial): _____

Address: _____

City: _____ State/Zip: _____

County: _____

Phone: _____

Email: _____

Submitter is: ☐ AgriLife personnel ☐ Homeowner ☐ Consultant
☐ Golf course ☐ Commercial ☐ Other_____

Send result via: ☐ Email ☐ Standard mail **Send results to:** ☐ Submitter ☐ Grower ☐ Third party _____

Complete form for diagnostic services. PRINT and mark ☑ all that apply.

Plant: _____ *Variety/cultivar:* _____ *Planting date:* _____

Date first noticed: _____ *Problem developed:* ☐ *Suddenly* ☐ *Gradually*

Watering practices: ☐ *Sprinklers* ☐ *Hand water* ☐ *Drip system* ☐ *None*
☐ *Less than 3 times/week* ☐ *More than 3 times/week* ☐ *Variable/as needed* ☐ *Daily*

Pesticide/chemical application in last 3 weeks? ☐ *Yes* ☐ *No* *Product applied?* _____

Have you consulted other labs? ☐ *Yes* ☐ *No* *If yes, what was concluded?* _____

Have you contacted an AgriLife Extension Agent about this problem? ☐ *Yes* ☐ *No*

Would you like for us to send a copy of your results to your County Extension Agent? ☐ *Yes* ☐ *No*

Comments: _____

As of January 01, 2017: Routine diagnostic charge is $35 per specimen. This includes triage, microscopy, culturing and other basic tests as necessary, diagnostic report, and management suggestions. All out-of-state samples will be assessed a $20 surcharge/sample.
Refer to the back of this form to view sampling and mailing instructions and/or make additional comments regarding the specimen.

If requesting a specific test, please select from the following (see http://plantclinic.tamu.edu/services for test details):

Covered under our $35 routine diagnostic charge:	Tests that will be assessed an additional $20 each:		Tests that will be assessed an additional $30 each:
☐ Oak Wilt	☐ Bacterial Leaf Scorch (*Xylella sp.* - ELISA)	☐ Virus	☐ Bacterial Leaf Scorch (*Xylella sp.* - PCR)
☐ Dutch Elm Disease (DED)	☐ *Phytophthora sp.* Root Rot	☐ Plant Pathogenic Bacterial Identification	☐ Palm Phytoplasma Disease (lethal Decline/ Lethal Yellowing)
☐ Cotton Root Rot	☐ Bacterial Leaf Spot (*Xanthomonas sp.*)	☐ Rose Rosette	☐ Ornamental Phytoplasma
☐ Turfgrass Diseases			☐ Palm Fusarium

Send bill to: ☐ Submitter ☐ Grower ☐ Third party _____ Acct/PO Ref: _____
Make checks payable to **Texas AgriLife Extension Service.**
I agree to pay a minimum of $35 for this service; fees may be greater, based on services performed. I understand that accurate disease identification, diagnosis, and management recommendations are dependent on submission of appropriate specimens with thorough background information. Incomplete information and/or poor samples may lead to inaccurate diagnosis.

Signature: _____ Printed name: _____ Date: _____

TEXAS A&M AGRILIFE EXTENSION

Thanks to the Senate Bill 881

Questions?