

Leafroll Virus in Texas

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Abstract

Old- world Italian and French literature cite “rosso” and “rougeau” in association with grapevine culture; however at that time it was thought to be purely physiological in nature. Rampant spread of this complex set of viruses, now being called Grape Leafroll associated Viruses (GLRaV) is being blamed on (1) “Suit-case” clones transported throughout the world, (2) inexpensive vegetative grapevine cuttings being shared between growers and (3) use of newer rootstocks in the post-phylloxera period after the 1990’s. The old notion that “a little bit of Leafroll Virus is a good thing” has been replaced by research on the adverse effects of wine quality from infected vines, and thus the economic impact is only now being realized. Worldwide research efforts have also implicated mealy bugs in disease transmission, identified strain differences to be distinct species, improved lab detection methods and have helped developed disease management strategies to control GLRaV. The virus has been noted anetodely in vineyards throughout Texas for many years, however increased grower awareness of the new range of possible symptoms, along with correct sampling procedures and improved access to laboratory diagnostics will help curtail future economic impact to our grape and wine industry in Texas.



Photo by Pennv S. Adams

Introduction

Most grape growers are familiar with typical GLRaV symptoms of late-season red, cupping leaf blade margins (red fruited varieties); however many other symptoms are now being associated with these viruses which prove useful in detection.

Currently there are at least nine identified virus species linked with Grapevine Leafroll Associated viruses belonging to the Closteroviridae family. The majority of species within this family, those known only to be transmitted by mealybugs are referred to as Ampeloviruses. Mixed infections can occur, generating variants of the virus and complicating detection and diagnostics. Awareness of new visual symptomology, combined with use of both ELISA (Enzyme-linked immune-sorbant assay) and RT-PCR (Reverse transcription-polymerase chain reaction.) will help growers mediate this virus.

Materials and Methods

Proper timing of sampling for best symptom detection and correct diagnosis of GLRaV is during late season. Growers should make visual observations, record and sample abnormal tissue as compared to vines of the same age, variety, clone and rootstocks at their location. Sampling a vineyard's major varieties and rootstock combinations is suggested. A representative sample taken from a single suspect vine should include approximately 10-12 leaf blades and petioles collected into a labeled plastic bag and kept under refrigeration until lab analysis. Single vine samples should be tested using ELISA and RT-PCR simultaneously to give the best combined analysis. Documentation at the time of sampling should include GPS Location of vineyard, grape variety, clone and rootstock, age of vine, vine source if known, visual symptoms if any and presence or absence of mealybug and other possible vectors. Detection using ELISA is limited to the amount of actual virus particles present, however it can detect numerous virus variations. Sensitivity via the amplification process of RT-PCR allows detection of any amount of virus present in the sample yet this method requires design of new primers as new virus variants are identified. Use of both techniques simultaneously will more accurately detect GLRaV. A coordinated sampling effort among growers within Texas would be the most economically feasible and would help create a baseline of incidence, distribution, strain identification and suggested control measures of GLRaV for Texas winegrape growers.

Results and Discussion

Leafroll virus symptoms that occur on infected vines resemble nutritional deficiencies and premature senescence, which can make them difficult to diagnose by visual inspection, particularly in the early years of infection. (Karasev, 2000). The lack of symptoms in any type of grapevine does not guarantee freedom from infection by the viruses that are the causal agents of leafroll disease. (Weber et al.1993). Variations of leaf blade colors (including yellow, purple and crimson-orange) with variations of vein color (including red, purple, yellow or normal green) depending upon grape variety and clone, location, stress factors involved and virus identification. Visual symptoms may actually be lacking or include a combination of leaf blade and vein colors, downward rolling or cupping of leaves, smaller, stunted vines, reduced yields, smaller grape clusters and uneven cluster ripening which cause loss of wine quality.

Leafroll infestation in a vineyard is usually not fatal to the crop in the first few years – however, significant losses can occur in the form of reduced yield and quality over time as leafroll spreads throughout the vineyard. (Golino *et al.*,1992).

Applications of Research

Statewide evaluations of GLRaV in Texas vineyards will help raise grower awareness regarding the spectrum of symptoms now associated with many strains, review sources of spread for the virus and help refine methods for control.

Grower Actions to Prevent the Spread of GLRaV

- Plant ONLY Certified Disease-Free Vine Materials
- Awareness of Spectrum of Symptoms
- Routinely Monitor for the Virus and Vectors

- Sampling of Symptomatic Vines
 - Use Good Sampling Procedures
 - Accurately Time Sampling
 - Send to Laboratory Qualified to Analyze
- Rouge Infected Vines
- Use Insecticides, like Neonicotinoids to control Vectors
- Avoid Vine Sharing
- Practice Good Sanitation of Equipment and Vineyard Workers Clothing
- Keep Appraised of Ongoing Research
- Support the National Clean Plant Network (<http://ucanr.org/ncpn>)

References

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