Title of Report: Summary Final Report for CDFA Agreement Number 15-0428-SA

"SEARCHING FOR POTENTIAL VECTORS OF GRAPEVINE RED BLOTCH-ASSOCIATED VIRUS"

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REPORTING PERIOD: The results reported here are from work conducted July 2015 – June 2018.

FUNDING AGENCIES
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OBJECTIVES

Our goal was to screen potential vectors for their ability to acquire and transmit GRBaV and, if a vector is discovered, to determine vector efficiency. Objectives for this research program were as follows:

1. Screen common vineyard insects and mites as potential vectors for GRBaV.
2. Screen uncommon organisms that feed on vines as potential vectors for GRBaV.
3. Follow disease progression in established vineyard plots to collect data on field epidemiology.

HIGHLIGHTS AND ACCOMPLISHMENTS

- Grapevine Red Blotch-associated Virus (GRBaV) is a newly identified vineyard pathogen causing vine damage similar to other Grape Leafroll Diseases (GLD).

- Our goals were to (a) test potential vectors commonly found in vineyards (leafhoppers, mealybugs etc.), (b) identify additional, novel candidate insect vectors, (c) test non-crop plants outside of vineyards as potential reservoirs of the virus, (d) document spread of GRBaV in commercial vineyards and (e) quantify virus titre levels throughout the grape vine over the course of the growing season.

- Our field studies have identified wild grape (*Vitis* spp.) as the sole reservoir of GRBaV outside of vineyards.

- Mapping of GRBaV in a large plot (20-acre vineyard) design from 2010 to 2016 and in five small plots (6 rows by 20 vines per row in five separate vineyards) from 2015 to 2018 documented GRBaV spread at these sites, but at each site showed a slow rather than rapid progression of newly infected vines.

- Field collections of potential vectors in vineyards showed a number of leafhoppers (*Erythroneura elegantula*, *Colladonus coquillett*, *Acinopterus angustatus*, *Scaphytopius* sp.) and treehoppers (*Spissistilus festinus*) tested positive for the virus.

- At five vineyards, insect populations and crop damage were sampled along transects that extend out from natural habitats into vineyards and densities of the three-cornered alfalfa hopper, *S. festinus* (and other possible vectors) were measured on both ground-covers and in the crop canopy along with petiole girdling. Results indicate three-cornered alfalfa hopper activity had a strong temporal trend, with densities generally increasing from June and August, but with some activity March, October and November. While there was no clear gradient across the transect points, densities were slightly elevated near natural habitats. Petiole girdling became apparent in August, with a higher proportion of girdles located at the vineyard interior; this increase follows increased *S. festinus* densities observed in the vine canopy between June and August.

- Laboratory transmission experiments with leafhoppers (*Erythroneura elegantula, E. variabilis, E. ziczac*), grape whitefly (*Trialeurodes vittatas*), mealybugs (*Planococcus ficus* and *Pseudococcus maritimus*), blue-green sharpshooter (*Graphocephala atropunctata*), and foliar form grape phylloxera (*Daktulosphaira vitifoliae*) found that none of these potential vectors moved the pathogen from an infected plant or plant material to a clean plant. The key findings from this project to date are that none of the common, abundant insects tested have been shown to transmit this virus, and the virus appears to be limited to plants in the genus *Vitis*.

- Laboratory transmission studies with the known vector, the three-cornered alfalfa hopper, found transmission from infected plants to clean plants to be difficult to obtain (in our trials)

- Ongoing studies seek to quantify GRBaV titer levels throughout the vine during the season in order to better understand acquisition and transmission by potential vectors.

- Conclusion. This work was undertaken to develop a GRBaV control program and provide accurate information on the epidemiology of this newly reported pathogen, its insect vectors and non-crop hosts. We have evaluated a number of potential vector candidates (all commonly found in vineyards) and, to date, none of the candidate vectors have transmitted the GRBaV from an infected plant to a clean plant. Rapid spread of this virus by an insect in commercial vineyards seems unlikely, and current movement is dependent on pathogen and TCAH abundance in or near vineyards. Findings from this research help improve our understanding of GRBaV transmission and field epidemiology to develop better recommendations and control programs for commercial growers.